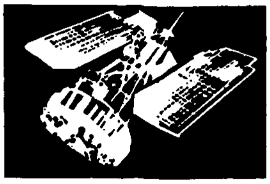
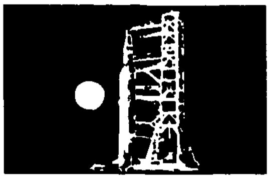
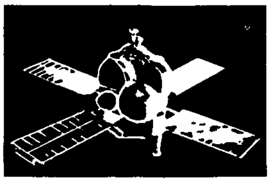
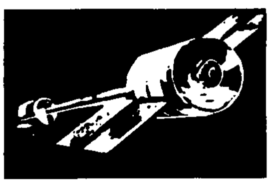
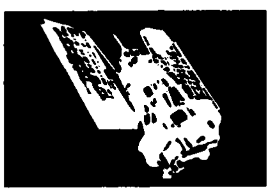
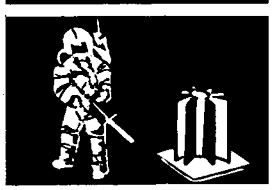
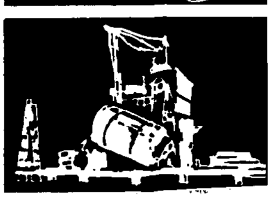
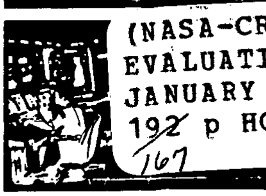
SPACE DIVISION


73SD4224
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23 OCTOBER 1972 TO 23 JANUARY 1973

Prepared By
GE ERTS OPERATIONS CONTROL CENTER

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GENERAL ELECTRIC

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INTRODUCTION

This is the third in a series of documents issued periodically to present flight performance analysis of the ERTS-1 Spacecraft. The first, ERTS-1 Launch and Flight Activation Evaluation Report dated 18 October 1972 (72SD4255), gives a summary of each subsystem, the spacecraft configuration, a table of command matrix, telemetry matrix and the launch configuration. The second ERTS-1 Flight Evaluation Report dated 28 November 1972 (72SD4262) covers the period from July 23 to October 23, 1972.

This report contains analyses of performance for the second three months of operation, i.e., orbits 1300 to 2600.

Future ERTS-1 reports are scheduled on a quarterly basis.

SECTION 1

SUMMARY - ORBITS 1300-2600

The ERTS-1 spacecraft was launched from the Western Test Range on 23 July 1972 at 18:06:06.508Z. The launch and orbital injection phase of the space flight were nominal and deployment of the spacecraft followed predictions. Orbital operations of the spacecraft and payload subsystems were satisfactory through Orbit 147 after which a power transient disabled one of the Wideband Video Tape Recorders. Operations resumed until Orbit 196 when the Return Beam Vidicon failed to respond when commanded off. The RBV was commanded off via alternate commands and since that time ERTS-1 has performed its mission with the Multispectral Scanner and the remaining Wideband Video Tape Recorder providing image data.

ORBITAL PARAMETERS

The launch and injection of ERTS-1 required some correction at Orbit 44 and 59 to achieve the desired 18-day repeat cycle. These corrections were made as noted in Section 7. During Orbit 938 it was necessary to execute a 12.8 second burn and in Orbit 2416 a 20.4 second burn of the -X thruster to maintain the ground trace in the desired 18-day repeat pattern of ± 10 miles.

POWER SUBSYSTEM

The power subsystem performed well throughout this report period. Solar array current has been following close to prediction. Data from this period shows the array degradation to be slightly higher than projected but the power subsystem will meet ERTS-1 power requirements through all of 1973. Battery temperature spread increased but performance of each battery remained good.

ATTITUDE CONTROL SUBSYSTEM

From the initial acquisition, the ACS performance has been excellent. All functions are active and well within specifications. Perturbations due to sun glint in the IR horizon scanners are not disruptive enough to necessitate single scanner mode. The magnetic moment compensating

assembly corrected the + Roll gating to permit flywheel unloading during darkness when payloads are disabled. Gating frequency leveled off during this period and only six percent of the impulse available at launch has been used. The ACS responded well to orbit adjust maneuvers.

COMMAND/CLOCK SUBSYSTEM

All stored commands have executed and all real time commands except the expected one in approximately 10,000 associated with the logic race in the design. No serious problems have resulted from these few commands failing to execute. A minor anomaly has occurred in Comstor B; cell 12 which on thirteen occasions verified with a delta of 256 seconds change to the desired execute time. Each time, a second try verified correctly. No explanation has yet been found for this condition.

TELEMETRY SUBSYSTEM

The telemetry subsystem has consistently performed in an excellent manner. Memory Section 0, 0 has been in use since launch and no alternates have been required. All drop-outs have been associated with known link or ground problems.

ORBIT ADJUST SUBSYSTEM

The orbit adjust subsystem has been fired five times, all from the -X thruster. The four second burn gave 60 percent of computed thrust but longer burns gave very near computed thrust. Three firings were for initial correction, two for orbit maintenance.

MAGNETIC MOMENT COMPENSATING ASSEMBLY

The Magnetic Moment Compensating Assembly has been operated six times and performance has been reasonably close to nominal. The hysteresis loop associated with the MMCA requires trial and error after the first charge and dump. The attained performance of the unit is considered excellent. It has held the Pole-Cm values commanded in earlier orbits.

UNIFIED 'S' BAND/PRE-MODULATOR PROCESSOR

The Unified 'S' Band Receiver, Transmitter, and Premodulation Processor have continued to operate satisfactorily, even though telemetry indicates the power output of the 'A' transmitter has dropped to 0.6 watts from its launch value of 1.6 watts, the system still exceeds

the link margin requirements. Transfer to the second 'B' transmitter is not expected to be required until March 1973. No adverse effects have been observed on its performance of telemetry reporting, ranging and relay of DCS messages.

ELECTRICAL INTERFACE SUBSYSTEM

The Auxiliary Processing Unit (APU), Interface Switching Module (ISM), and Power Switching Module (PSM) performed normally in this report period.

THERMAL CONTROL SUBSYSTEM

The thermal subsystem performed normally throughout this report period. Temperatures increased slightly due to increasing sun intensity but had no noticeable effect on operation.

NARROW BAND TAPE RECORDERS

The Narrow Band Tape Recorder Subsystem has continued to operate satisfactorily. Each recorder in turn has operated through its modes of record, standby, playback and off for a total ON time of 2281 hours.

WIDE BAND TELEMETRY SUBSYSTEM

The Wide Band Telemetry Subsystem has continued to operate satisfactorily. Wide Band Power Amplifier No. 2 has been the primary instrument used to transmit MSS data to ground stations, but during the period of the Apollo moon operations, Wide Band Power Amplifier No. 1 was substituted because of more compatible frequencies. No affect on performance was observed.

ATTITUDE MEASUREMENT SENSOR

The AMS continues to function in all respects. Derived values are being used in image processing and effort is continuing to improve correlation relationship between spacecraft attitude, the ACS and the AMS.

WIDE BAND VIDEO TAPE RECORDERS

The Wide Band Video Tape Recorder No. 1 has operated satisfactorily since launch. Wide Band Video Tape Recorder No. 2 failed in Orbit 148. MSS video reproduction, MSS Bit Error Rate, search track, control track and spacecraft time are all nominal.

RETURN BEAM VIDICON

The Return Beam Vidicon Subsystem has been idle since Orbit 196, when its input power supply switching system malfunctioned. The RBV had operated satisfactorily up to that point, photographing 1690 scenes of good quality. The failure was not in the RBV itself, nor was the RBV affected by the failure.

MULTISPECTRAL SCANNER SUBSYSTEM

The Multispectral Scanner Subsystem (MSS) has operated satisfactorily. Since launch, the MSS has imaged 35,331 scenes, an average of 195 per day, covering an area seven times the total land mass of the earth. The steady decrease of the cal wedge level in Bands 1 and 2 experienced through the first 1200 orbits, has been reversed to a slight rise.

DATA COLLECTION SYSTEM

The Data Collection Subsystem (DCS) continued to operate satisfactorily. The DCS experienced several periods of external interference and one 9-day interval of fewer-than-expected messages received, but returned to normal operations after each incident. 129,750 messages have been received of which over 85% were perfect messages. The number of platforms has risen to 218 and the number of users to 30. 83 platforms have been active in a single orbit and messages have been received on a single orbit without discernible mutual interference, only receiver No. 1 has operated to date.

PAYLOAD OPERATION SUMMARY

Launch through Orbit 2600*

SUB-SYSTEM	ORBITAL ON-TIME H M S	OPERATIONAL SUMMARY	
RBV	13:59:09	Total scenes photographed	1,690
		Average scenes per day	139
		Total area photographed square nautical mile	$14.7X10^6$
		ON-OFF cycles	91
		% Real Time scenes	57
		% Recorded scenes	43
MSS	350:21:57	Total scenes photographed	35,331
		Average scenes per day	195
		Total area photographed square nautical mile	$307.9X10^6$
		ON-OFF cycles	3,073
		% Real Time scenes	44
		% Recorded scenes	56
DCS	4467:06:00	Message received at OCC	129,750
		Non perfect messages	10,386
		Ground platforms identified	218
		Ground platforms active/orbit	83
		Users	30
		Average messages per orbit	100
WBVTR-1	392:20:56	% Record Mode	36
		% Playback Mode	43
		% Rewind Mode	20
		% Standby Mode	1
		Minor Frame Sync Error Count: Playback	under 10
WBVTR-2	9:26:33	% USAGE SAME AS WBVTR-1 FAILED IN ORBIT 148/9	
WPA-1	31:55:09	% Real Time Mode	49
		% Playback Mode	51
		Used in Orbits: 5 thru 196 and 1890 thru 2099	
		ON-OFF cycles	311
WPA-2	235:54:48	% Real Time Mode	51
		% Playback Mode	49
		Used in Orbits: 5 thru 1889 and 2100 thru 2600	
		ON-OFF cycles	1,601

*Test time prior to launch contained in Appendix D. Flight Hardware Operating Time Summary

SECTION 2

ORBITAL PARAMETERS

The ERTS 1 launch and injection was satisfactory and required only a minor orbit adjust to achieve nominal parameters. These adjustments were made in orbit 38, 44 and 59. After several repeat cycles orbit maintenance burns were made in Orbit 938 and again in Orbit 2416.

The orbital parameters are given in Table 2-1. Figure 2-1 shows the subsatellite plot and Figure 2-2 shows the longitude error as a function of time and orbit maintenance burns. Figure 2-3 is a summary of ERTS-1 orbital periods.

Table 2-1. Orbital Parameters

	Element		Planned	25 Oct 1972	25 Jan 1973
(1)	Apogee	KM	917	917.3	922.3
(2)	Perigee	KM	917	898.1	893.1
(3)	Inclination	deg	99.0919	99.103	99.090
(4)	Semimajor Axis	KM	7,294.662	7,285.850	7,285.865
(5)	Eccentricity	--	0.0001	0.00132	0.00200
(6)	Anomalistic Period	min	103.341	103.152	103.153
(7)	Nodal Period	min	--	103.268	103.268
(8)	Argument of Perigee	deg	0	93.721	133.693
(9)	18 day repeat cycle	NM	±5	+1.25	+2.72

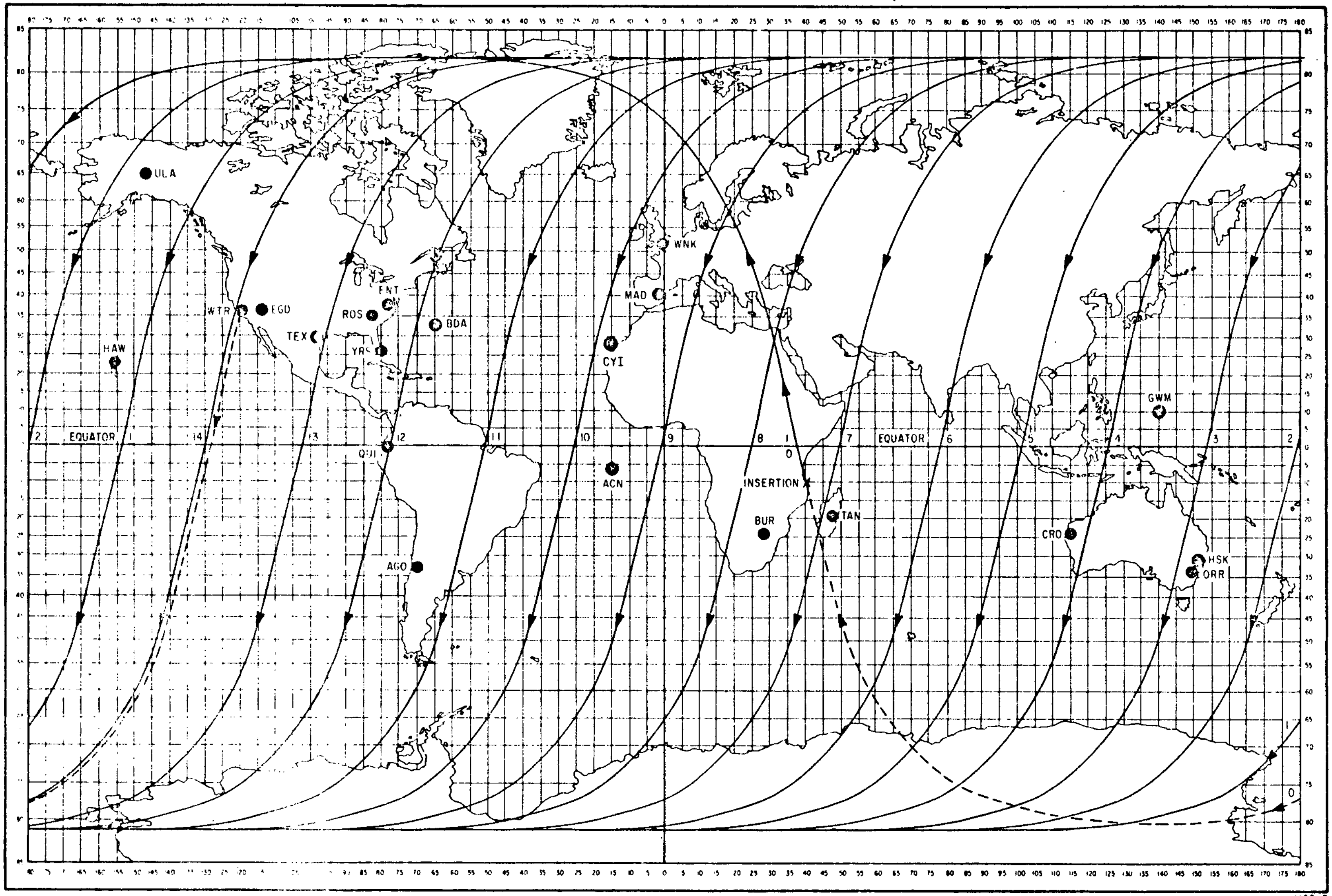
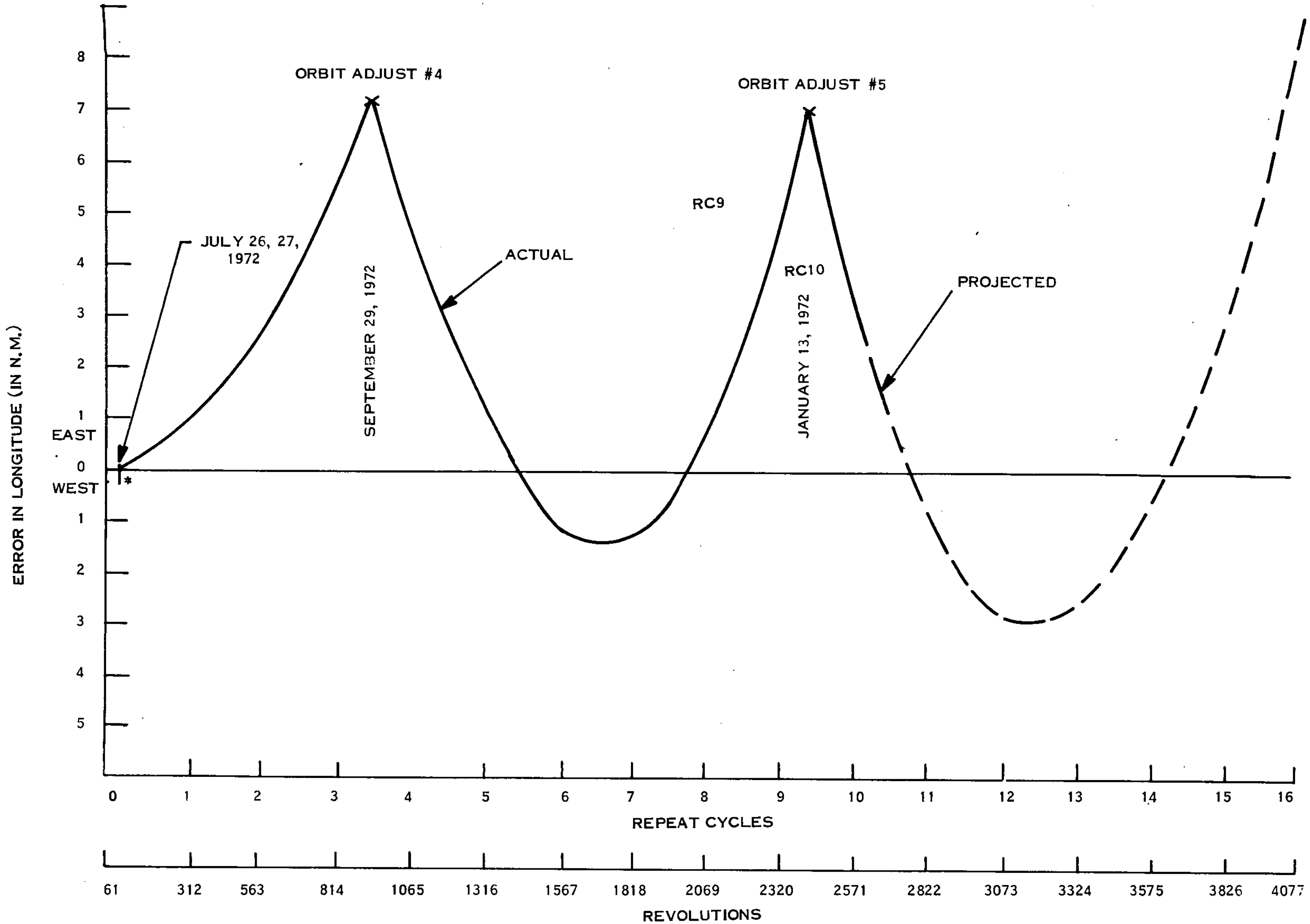


Figure 2-1. Typical Subsatellite Plot of the ERTS-1 Spacecraft



* ORBIT ADJUST NO'S 1, 2, 3 TO ACHIEVE NOMINAL PARAMETERS

RC = REPEAT CYCLE

Figure 2-2. Effects of Orbit Adjust on Ground Track

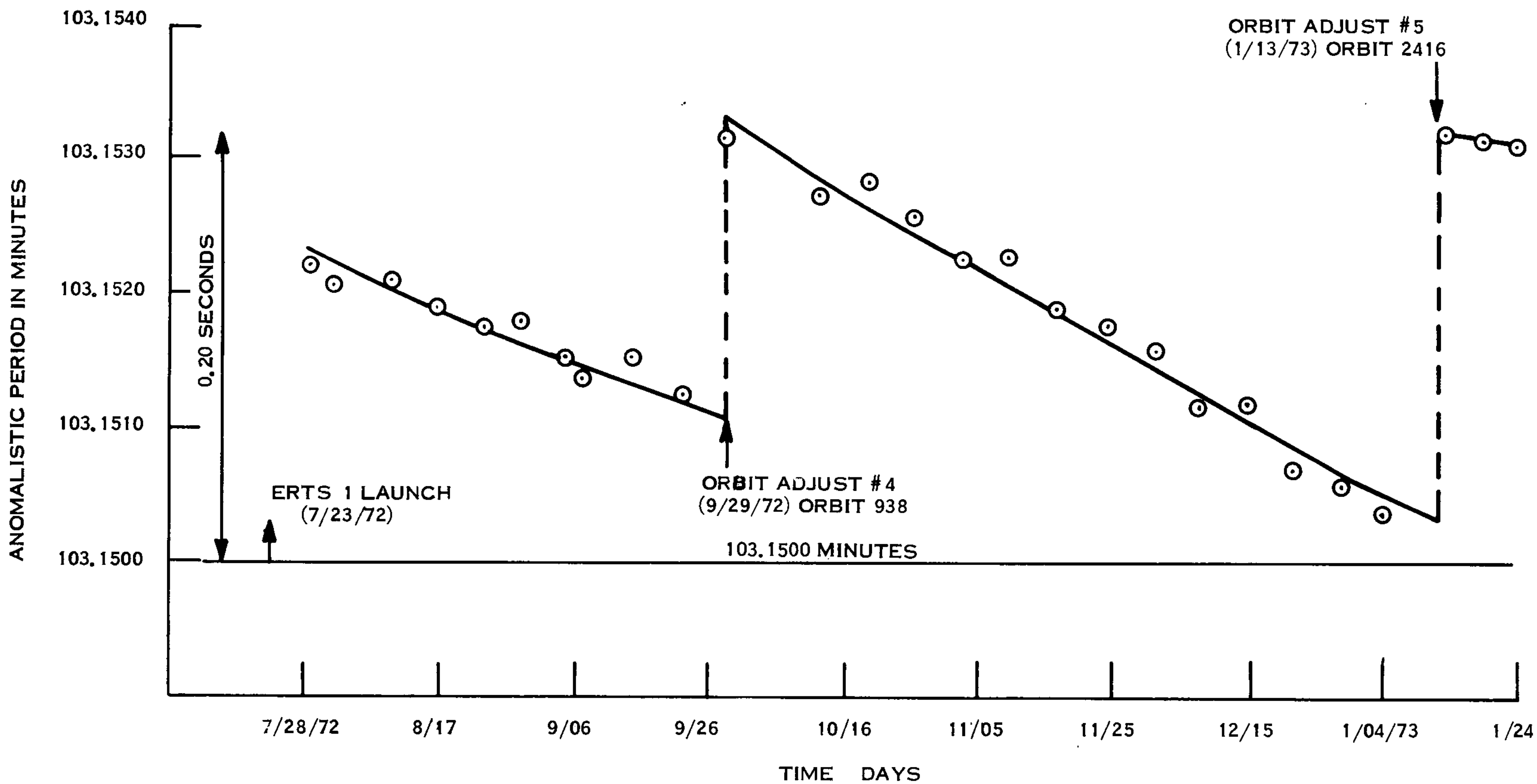


Figure 2-3. ERTS-1 Orbital Period

SECTION 3

POWER SUBSYSTEM (PWR)

The power subsystem continued to perform well.

The solar array provided excess energy for the payload and spacecraft load throughout this report period. Compensation loads and auxiliary loads dissipated the excess power above the battery pack and load requirements using ERTS-1 power management procedures. Midday measured solar array current tracked quite closely to the predicted value and is beginning to decrease as anticipated due to decreasing sun intensity. Solar Array Degradation is revised (based on data from this report period) to a higher rate of decline and is now predicted to be down 17.1 percent (compared to previous predictions of 13.6 percent) at the end of one year. The power subsystem is predicted to meet the ERTS-1 power requirements through all of 1973. A plot of measured and predicted Midday Solar Current for 1972 and 1973 is shown in Figure 3-1. Figures 3-2 and 3-3 show actual and predicted solar array degradations for 1972 and 1973. Figure 3-4 shows actual and predicted solar paddle sun angle for 1972 and 1973. Figure 3-5 shows seasonal sun intensity variations. In orbits 2298 and 2299, the solar array current dropped to 13.50 and 11.8, respectively from 14.30 amperes near midday as the spacecraft passed through an annular eclipse of the sun.

Battery packs ranged from 9 to 16 percent Depth of Discharge (DOD) with an average of 11 percent over a 24-hour period of normal operation. Temperature spread between battery packs increased to approximately 6.5°C during this report period due to increasing sun intensity and payload operation. Charge and load sharing were satisfactory. During recovery of normal operation after a station command problem, the batteries discharged to -473 ampere-minutes or 22.5 percent DOD in orbit 1819. The battery voltages were 27.53 volts. Prelaunch battery tests performed on June 24, 1972, show 28.45 volts for 22.5 percent DOD. This decrease in voltage is the combined result of battery degradation and loss of conditioning due to prolonged operation at 9-16 percent DOD. From this data, it is predicted that battery packs will give satisfactory operation through 1973 for the

present MSS payload and WBVTR operation. Table 3-1 shows major power subsystem parameters for typical power management orbits (complete night followed by a complete day).

The power system electronics performed well in this report period with all voltages stable. During orbit 1819, the unregulated bus voltage went to 26.69 volts (lowest flight operation to date); regulator voltages remained stable at their normal values. Table 3-2 shows power subsystem telemetry (average over telemetry period recorded on NBTR) for various orbits. Some parameters in Table 3-2 may be slightly different from Table 3-1 because Table 3-1 uses a time span for power management (night followed by a day) different from the time span used in Table 3-2 which is the playback period from the NBTR. Auxiliary loads are switched each orbit and with the compensation loads dissipate excess array power above that needed by the batteries and loads. Though battery temperature spread is higher, the temperature and battery voltages have been held to satisfactory operating limits. The Shunt Limiter has not operated since orbit 3 because the unregulated voltage has been held below the cut-in voltage by power management.

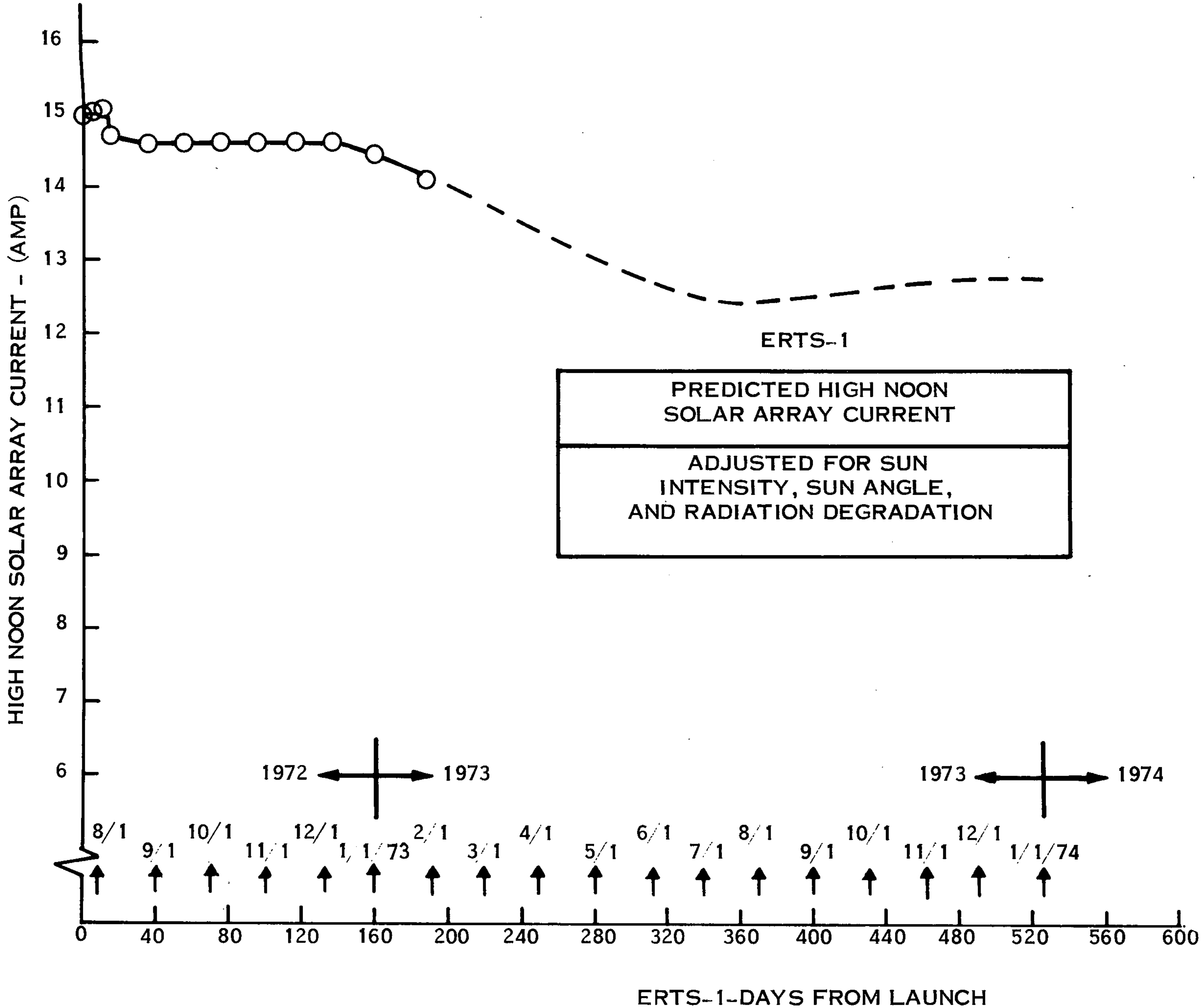


Figure 3-1. Predicted High Noon Solar Array Current

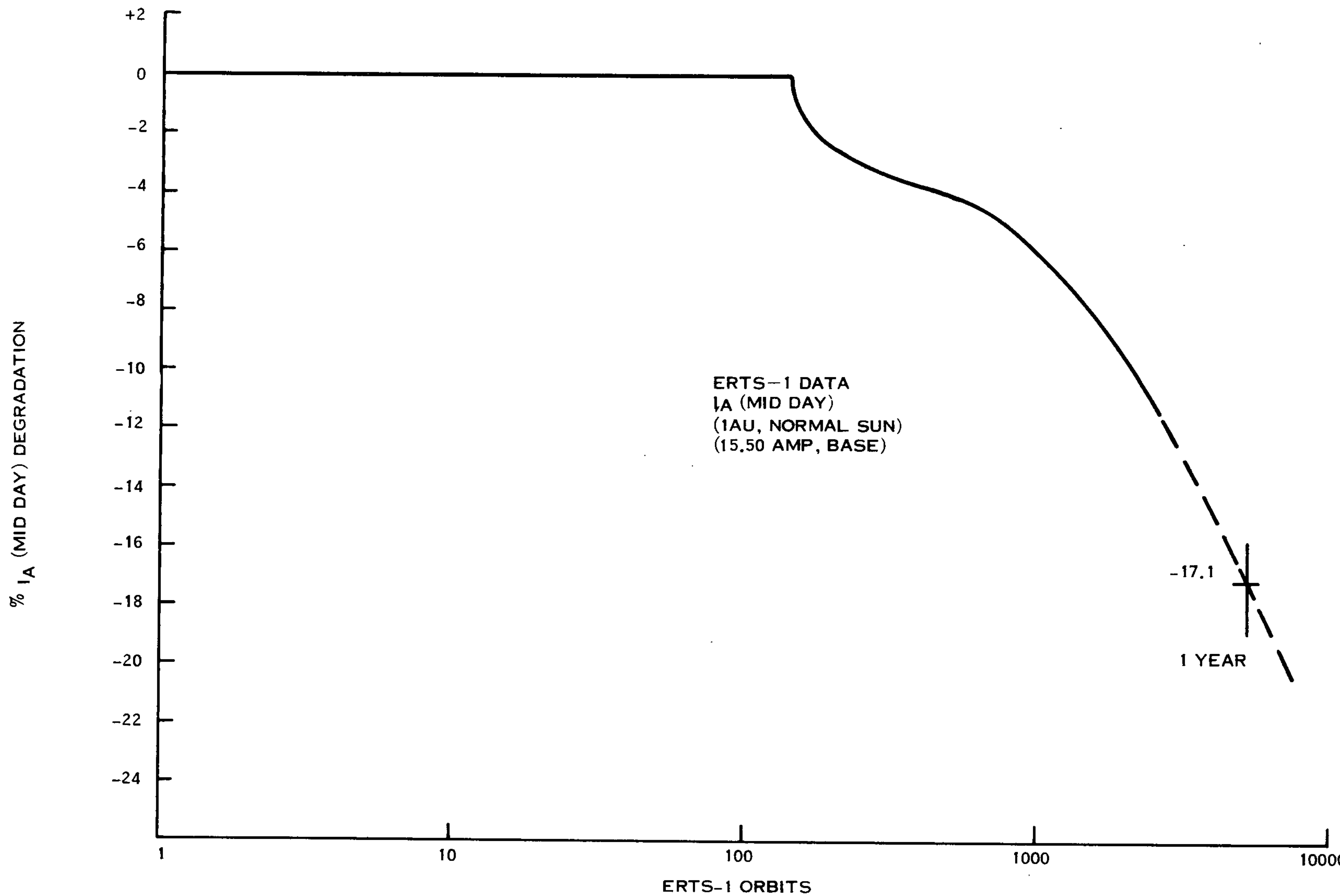


Figure 3-2. I_A (Midday) Degradation vs. Orbits

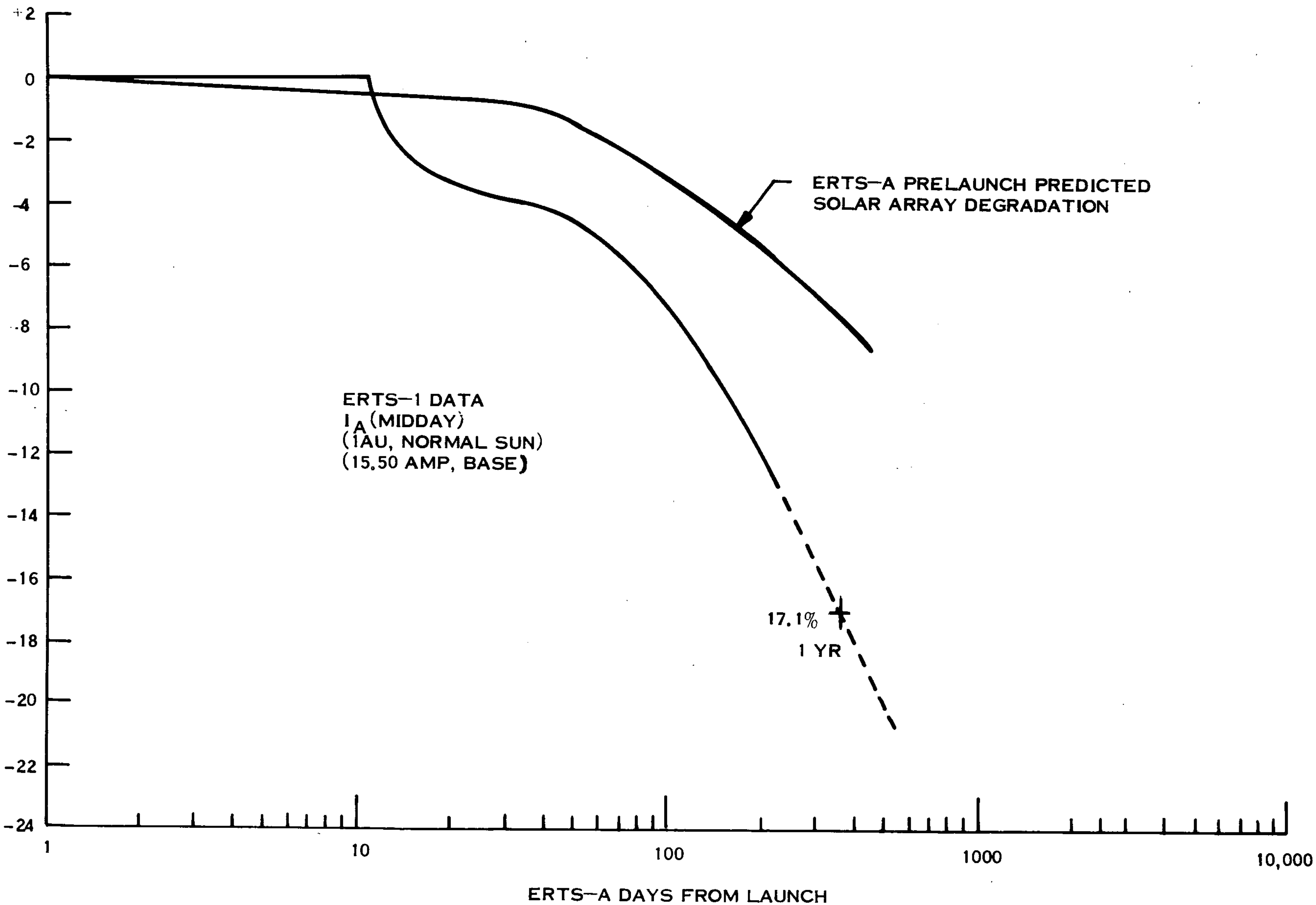


Figure 3-3. I_A (Midday) Degradation vs. Days

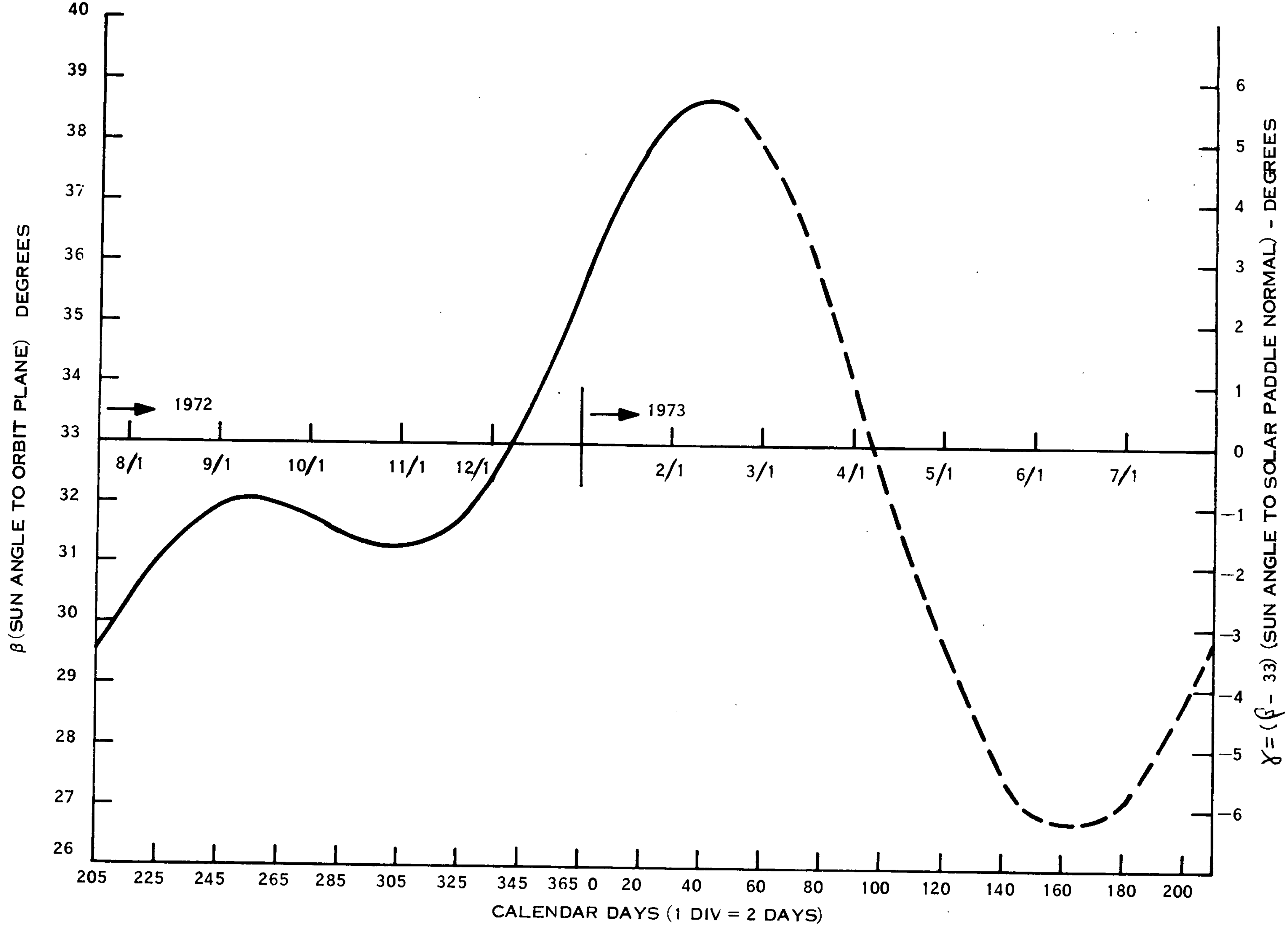


Figure 3-4. Actual and Predicted β and Paddle Sun Angles

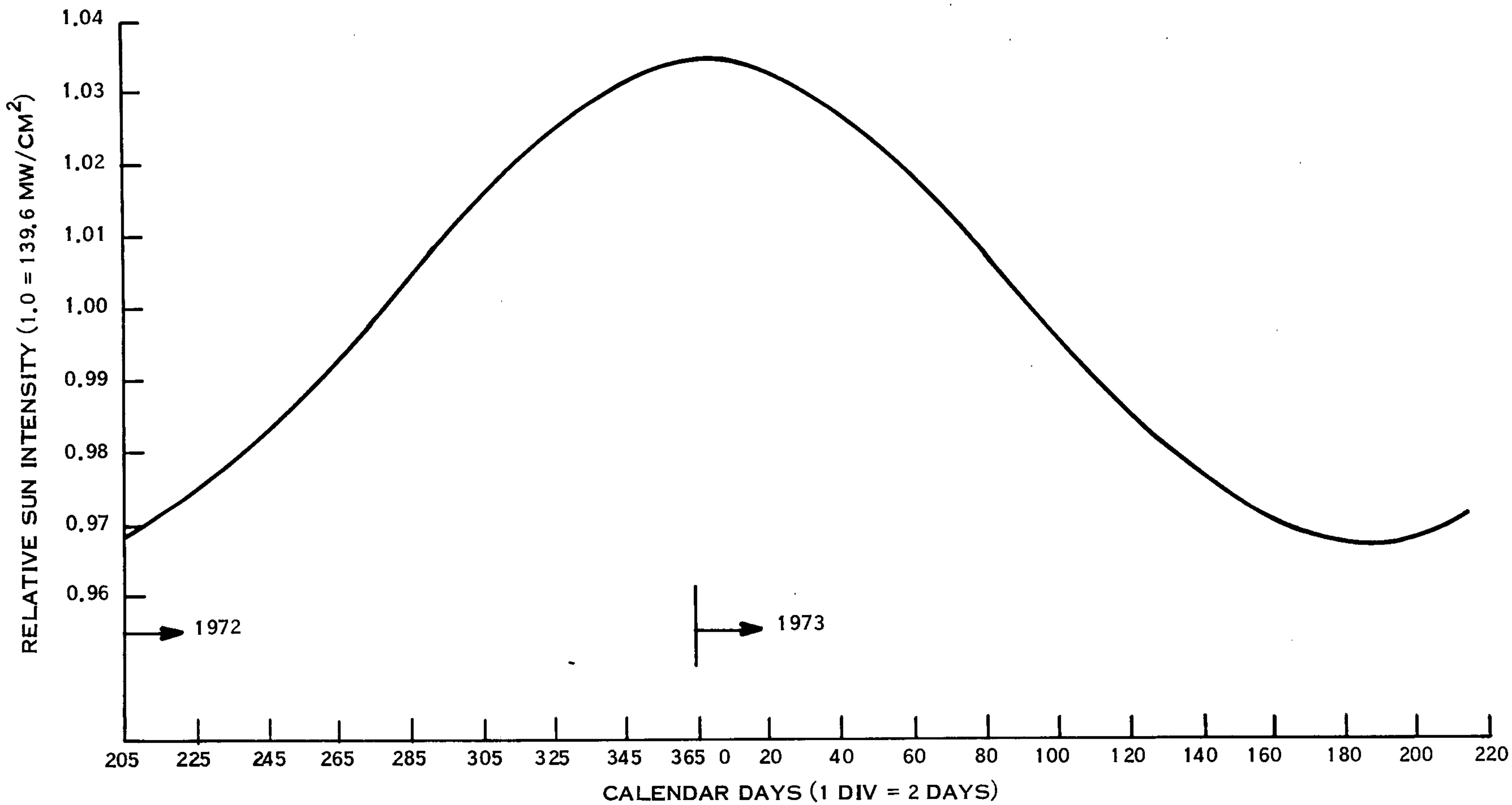


Figure 3-5. Seasonal Solar Intensity Variation

Table 3-1. Major Power Subsystems Parameters

Orbit No.	7	26	500	899	1291	1799	2198	2600
Batt 1 Max	32.91	32.48	32.99	32.91	32.99	33.08	32.82	32.91
2 Chge	32.91	32.48	32.99	32.82	32.99	33.08	32.82	32.91
3 Volts	32.91	32.48	33.08	32.91	32.99	33.16	32.82	32.91
4	32.91	32.48	33.08	32.91	32.99	33.16	32.82	32.91
5	32.91	32.48	33.08	32.99	32.08	33.16	32.91	32.99
6	32.82	32.31	33.08	32.91	32.99	33.16	32.82	32.91
7	32.82	32.22	33.08	32.91	32.99	33.08	32.82	32.91
8	32.82	32.14	33.08	32.91	32.99	33.16	32.82	32.91
Average	32.87	32.38	33.06	32.91	33.00	33.13	32.83	32.92
Batt 1 End-	29.32	28.81	29.23	28.21	28.55	29.32	28.38	28.12
2 of-	29.32	28.81	29.32	28.30	28.55	29.32	28.38	28.12
3 Night	29.23	28.21	29.23	28.21	28.55	29.32	28.38	28.04
4 Volts	29.32	28.89	29.32	28.30	28.55	29.32	28.38	28.12
5	29.41	28.29	29.32	28.30	28.64	29.41	28.47	28.21
6	29.23	28.81	29.23	28.21	28.55	29.32	28.38	28.04
7	29.32	28.89	29.32	28.30	28.55	29.32	28.38	28.12
8	29.23	28.81	29.23	28.21	28.55	29.32	28.38	28.12
Average	29.30	28.84	29.28	28.25	28.56	29.33	28.39	28.11
Batt 1 Chge	13.51	13.11	13.54	13.12	13.29	13.32	13.22	13.00
2 Share	12.80	12.93	12.87	13.17	12.95	13.18	12.94	13.00
3 (%)	10.82	11.38	11.10	11.55	11.23	11.03	11.28	11.53
4	12.34	12.39	12.21	12.32	12.29	12.20	12.25	12.13
5	12.36	12.32	12.33	12.25	12.30	12.38	12.21	12.41
6	12.77	12.80	12.66	12.64	12.74	12.75	12.70	12.82
7	13.01	12.62	12.88	12.65	12.83	12.85	12.03	12.66
8	12.39	12.45	12.41	12.31	12.36	12.27	12.58	12.45
Batt 1 Load	12.81	12.71	12.67	12.70	12.68	12.66	12.72	12.61
2 Share	13.20	12.90	13.47	13.37	13.71	13.78	13.47	13.43
3 (%)	11.38	11.43	11.84	11.87	12.09	12.08	11.86	12.11
4	12.75	12.77	12.95	12.71	12.89	12.98	12.76	12.88
5	12.37	12.54	12.17	12.31	12.32	12.28	12.39	12.29
6	12.59	12.53	12.47	12.45	12.24	12.16	12.36	12.29
7	12.84	12.80	12.50	12.41	12.33	12.33	12.53	12.27
8	12.06	12.32	11.93	12.17	11.74	11.73	11.90	12.12
Batt 1 Temp	22.15	21.11	24.02	24.19	24.63	24.46	24.61	25.13
2 in	19.27	18.74	20.53	21.92	21.37	21.35	21.39	22.33
3 (°C)	19.14	18.77	19.85	20.49	20.36	20.25	20.33	20.72
4	22.14	21.57	22.88	22.75	23.41	23.49	23.23	23.23
5	22.86	21.02	24.17	24.15	24.67	25.28	25.49	26.77
6	22.38	21.21	24.00	24.15	24.98	25.41	25.70	26.95
7	22.80	21.41	24.76	24.85	25.64	25.83	26.07	27.18
8	22.99	21.82	24.92	25.11	25.67	25.67	25.96	26.68
Average	21.72	20.81	23.14	23.45	23.84	23.97	24.10	24.87
S/ Reg Ring	167.9	176.8	184.5	179.5	168.0	163.6	159.7	182.3
Comp Load Part (W) (P/U S/C Reg Bus)	49.0	49.0	49.0	41.8	41.8	34.8	34.8	34.8
P/L Reg Bus Pwr (W)	8.1	16.2	12.0	31.9	19.6	12.2	17.0	36.1
C/D Ratio	1.41	1.06	1.15	1.10	1.17	1.25	1.07	1.08
Total Charge (A-M)	327.8	309.2	282.3	343.0	296.8	267.22	285.64	353.85
Total Discharge (A-M)	232.6	290.9	245.2	312.9	253.6	214.21	267.40	327.08
Solar Array (A-M)	1058	1044	1034	1040	1033	1034	1038	1028
S.A. Peak I (A)	15.8	15.8	15.45	15.45	15.36	15.45	15.36	15.10
Beta Logic (DES)	-3.40	-3.33	-1.17	-1.10	-1.65	-0.65	+2.25	+5.15
Max R Pad Temp (°C)	+65.0	+65.0	+68.0	+69.0	+71.0	+72.00	+72.00	71.00
Min R Pad Temp (°C)	-59.0	-62.0	59.0	-58.0	-58.0	-59.00	-57.00	-56.00
Max L Pad Temp (°C)	+56.1	+57.9	+60.5	+61.4	+65.0	+66.00	+67.00	+66.00
Min L Pad Temp (°C)	-66.0	-67.0	-66.0	-64.0	-64.0	-65.00	-62.00	-60.00

Table 3-2. Power Subsystem Analog Telemetry (Average Value for Frames of Data Received in NBTR Playback)

Function	Description	Unit	Orbit 7	Orbit 26	Orbit 500	Orbit 899	Orbit 1291	1799	2201	2600
6001	Bat 1 Disc	Amp	0.94	0.94	0.87	0.89	0.96	0.83	1.02	1.23
6002	2		0.98	0.95	0.93	0.94	1.03	0.91	1.07	1.29
6003	3		0.83	0.84	0.80	0.83	0.91	0.78	0.96	1.17
6004	4		0.93	0.93	0.89	0.89	0.98	0.85	1.01	1.23
6005	5		0.89	0.92	0.84	0.86	0.93	0.80	0.98	1.19
6006	6		0.92	0.91	0.85	0.87	0.93	0.79	0.97	1.20
6007	7		0.93	0.94	0.86	0.87	0.95	0.81	1.00	1.19
6008	8		0.87	0.91	0.83	0.84	0.90	0.76	0.96	1.18
6011	Bat 1 Chg	VDC	0.62	0.58	0.60	0.71	0.58	0.58	0.54	0.71
6012	2		0.59	0.57	0.57	0.72	0.56	0.57	0.54	0.71
6013	3		0.50	0.50	0.49	0.63	0.49	0.48	0.48	0.63
6014	4		0.57	0.54	0.54	0.67	0.54	0.53	0.50	0.66
6015	5		0.57	0.54	0.54	0.67	0.54	0.53	0.51	0.68
6016	6		0.59	0.57	0.55	0.69	0.55	0.56	0.53	0.70
6017	7		0.60	0.55	0.56	0.69	0.56	0.55	0.52	0.70
6018	8		0.57	0.55	0.54	0.67	0.54	0.52	0.51	0.69
6021	Bat 1 Volt	VDC	31.61	30.87	31.40	30.94	31.28	31.17	31.23	30.74
6022	2		31.62	30.87	31.41	30.94	31.28	31.17	31.22	30.74
6023	3		31.62	30.87	31.41	30.94	31.29	31.17	31.23	30.74
6024	4		31.65	30.90	31.44	30.97	31.32	31.20	31.25	30.77
6025	5		31.69	30.95	31.48	31.02	31.36	31.25	31.31	30.82
6026	6		31.60	30.86	31.39	30.92	31.27	31.15	31.21	30.72
6027	7		31.62	30.89	31.42	30.96	31.30	31.18	31.25	30.76
6028	8		31.63	30.89	31.42	30.96	31.30	31.18	31.25	30.75
6031	Bat 1 Temp	DGC	22.49	21.17	23.89	24.18	24.61	24.58	24.44	25.19
6032	2		19.54	18.80	20.46	21.91	21.36	21.48	21.33	22.44
6033	3		19.36	18.76	19.82	20.50	20.36	20.37	20.20	20.80
6034	4		22.45	21.57	22.77	22.73	23.41	23.67	23.14	23.20
6035	5		23.09	21.84	24.10	24.09	24.64	25.57	25.39	26.86
6036	6		22.56	21.24	23.93	24.14	24.99	25.47	25.70	26.99
6037	7		23.10	21.43	24.67	24.87	25.67	25.91	26.08	27.20
6038	8		23.26	21.86	24.81	25.10	25.66	25.75	25.89	26.75
6040	RT Pad Temp	DGC	25.94	25.82	27.12	28.00	30.33	24.21	33.69	27.98
6041	R Pad V N	VDC	34.47	33.40	34.12	33.42	33.96	33.84	33.71	33.01
6042	R Pad V M	VDC	34.28	33.29	33.67	32.89	33.59	33.31	32.60	32.43
6044	Lt Pad Temp	DGC	14.03	14.14	16.10	17.34	19.50	15.11	20.90	18.56
6045	L Pad V F	VDC	34.74	33.69	34.41	33.70	34.26	34.18	34.06	33.71
6046	L Pad V G	VDC	34.79	33.68	34.45	33.72	34.27	34.18	34.10	33.73
6050	S/C Ur Bus V	VDC	32.05	31.24	31.80	31.29	31.69	31.37	31.73	31.03
6051	S/C Rg Bus V	VDC	24.54	24.54	24.54	24.54	24.55	24.54	24.55	24.54
6052	Aux Reg A V	VDC	23.41	23.41	23.50	23.47	23.47	23.49	23.48	23.46
6053	Aux Reg B V	VDC	23.50	23.50	23.50	23.50	23.50	23.50	23.50	23.50
6054	Solar I	Amp	14.77	14.87	14.38	14.35	14.40	14.22	14.25	13.97
6055	S/C Rg Bus I	Amp	6.86	7.11	6.99	7.17	6.86	6.69	6.54	7.45
6056	S/C Rg Bus I	Amp	6.86	7.11	6.98	7.17	6.85	6.69	6.54	7.46
6058	PC Mod T1	DGC	21.83	21.82	22.35	23.21	22.81	22.63	22.55	23.53
6059	PC Mod T2	DGC	21.63	21.68	22.25	22.91	22.74	22.73	22.61	23.08
6070	P/L Rg Bus V	VDC	24.67	24.66	24.68	24.67	24.68	24.66	24.69	24.67
6071	P/L Ur Bus V	VDC	31.90	31.08	31.65	31.15	31.54	31.22	31.57	30.88
6072	P/L Rg Bus I	Amp	0.33	0.57	0.41	1.13	0.79	0.50	0.69	1.47
6073	P Aux A V	VDC	23.50	23.51	23.51	23.53	23.52	23.51	23.51	23.53
6074	P Aux B V	VDC	23.50	23.51	23.51	23.53	23.52	23.51	23.51	23.53
6075	Pr Mod T1	DGC	21.52	21.50	22.38	24.00	23.15	23.24	23.28	24.40
6076	Pr Mod T2	DGC	20.38	20.34	20.88	22.07	21.47	21.62	21.56	22.31
6079	Fuse Blow V	VDC	24.56	24.56	24.58	-	-	-	-	-
6080	Shunt 1 I	Amp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6081	2		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6082	3		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6083	4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6084	5		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6085	6		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6086	7		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6087	8		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6100	P/L Rg Bus I	Amp	0.33	0.58	0.41	1.12	0.79	0.49	0.69	1.47
Total No.	Major Frames	FRM	385	764	783	394	390	520	610	425

SECTION 4

ATTITUDE CONTROL SUBSYSTEM (ACS)

Performance of the Attitude Control Subsystem has been excellent throughout the launch and orbital operations.

Gating for the ACS has been as noted in Figure 4-1 and Tables 4-1 and 4-2. (Figure 4-2, Early Gate History, is repeated for convenience). The small increase in number of gates/ orbit has ceased and the slope of the curve seems to be decreasing slightly. There appears to be a long-term correlation with seasons and beta angle and some short-term correlation with payload (especially the Wideband Video Tape Recorder) operations. These phenomenon are continuing to be studied.

Performance dynamics for the ACS during the orbit adjust in orbit 2416 is shown in Section 7.

ACS components have operated in a satisfactory manner throughout this period. Minor variations have been investigated but no specific problems found. An example is the slight increase (from 2% average to 5% average) in the Yaw Motor Drive duty cycle around orbit 1870, which lasted for several days. (See Figure 4-3.) A smaller excursion in the roll drive duty cycle was noted in orbit 1890 but returned to normal after several orbits. Near orbit 2150 the pitch drive duty cycle increased sharply to a peak of 50% duty cycle (see Figure 4-4), but returned to normal after fifteen (15) orbits. These unexplained data are being further investigated.

During preparation for the orbit maintenance burn in orbit 2416 RMP No. 1 was turned on and checked for performance. The identical outputs for RMP No. 1 and RMP No. 2 are shown in Figure 7-1. Figure 4-5 shows the dynamics for the RMP No. 1 coastdown after the unit was commanded off.

Figure 4-6 is included to illustrate the SAD motor winding voltages and sun sensor preamp output from a typical early orbit (241) and a recent orbit (2417). Table 4-3 gives typical ACS telemetry values.

Table 4-1. Impulse Useage ERTS-1

Item	Units	Orbit 0/1	Orbit 1300	Orbit 2600
Gas				
Remaining (2)	Lbs	12.02	11.63	11.00
Useable Impulse (3)	Lb-Sec	575.2	555.7	524.2
Gates	Total			
-Pitch		--	0	0
+Pitch		--	475	1431
-Roll		--	375	1030
+Roll		--	150	153 (1)

$$W = \frac{PV}{CRT}$$

Where:

W = Weight of Freon-14 in lbs

P = Tank pressure in lbs/ft^3

V = Tank volume in ft^3 (0.272 for ERTS-1)

C = Compressibility factor for Freon-14

R = Universal gas constant (17.55 for Freon-14)

T = Tank temperature degrees Rankine

(1) 3 + roll gates during orbit adjust (Orbit 2416)
(2) 0.516 lbs of Freon not useable due to manifold lock up pressure
(3) Freon-14 specific impulse = 50 lb-sec/lb

Table 4-2. ACS Gates/ Orbit

Orbit	+P	-P	+R	-R	Total
0-73	0.425	0	1.19	0	1.62
74-85 (1)	0.182	0	0.816	0	1.00
86-110	0.332	0	0.960	0.042	1.33
111-220 (2)	0.330	0	0.092	0.238	0.660
221-1300	0.370	0	0.019	0.323	0.710
1301-1950	0.670	0	0	0.508	1.18
1951-2200	0.805	0	0	0.541	1.34
2201-2400	0.813	0	0	0.487	1.30
2401-2600	0.810	0	0	0.476	1.28

(1) Sample too small for accuracy.

(2) MMCA adjustments completed at orbit 220.

NOTE: Yaw gates observed only during preparation for orbit adjust.

Table 4-3. ACS Temperature and Pressure Telemetry Summary

Function	Units	*T/V 20°C Plateau	Orbit			
			31	1799	2201	2600
1084 RMP 1 Gyro Temperature	DGC	79.0	44.5	24.12	24.48	24.28
1094 RMP 2 Gyro Temperature	DGC	73.0	74.3	75.07	75.08	75.07
1222 SAD RT MTR HSING Temp	DGC	28.0	21.1	23.12	23.50	23.07
1242 SAD LT MTR HSING Temp	DGC	27.0	27.0	31.74	32.37	32.27
1223 SAD RT MTR WNDNG Temp	DGC	29.0	25.3	27.67	27.87	27.39
1243 SAD LT MTR WNDNG Temp	DGC	29.0	28.7	34.54	35.27	34.99
1228 SAD RT HSG Pressure	PSI	7.57	7.6	7.59	7.59	7.53
1248 SAD LT HSG Pressure	PSI	6.91	7.0	7.10	7.07	7.04
1007 FWD Scanner MTR Temp	DGC	17.00	19.8	21.08	21.63	21.35
1016 Rear Scanner MTR Temp	DGC	25.00	20.5	20.88	21.37	21.25
1003 FWD Scanner Pressure	PSI	4.80	4.6	4.62	4.49	4.52
1012 Rear Scanner Pressure	PSI	5.16(1)	7.8	7.95	8.00	8.05
1212 Gas Tank Pressure	PSI	1810.	1988.	1908.	1886.	1849.
1210 Gas Tank Temperature	DGC	20.0	22.6	25.53	26.19	26.07
1213 Manifold Pressure	PSI	57.53	56.7	56.75	56.82	57.16
1211 Manifold Temperature	DGC	24.0	21.9	24.99	25.58	25.51
1059 CLB Power Supply Card Temp	DGC	36.0	37.1	41.80	42.74	42.22
1260 THO1 EBP	DGC	26.0	25.4	29.28	29.81	29.71
1081 RMP 1 MTR Volts	VDC	-30.13	Off	Off	Off	Off
1082 RMP 1 MTR Current	Amps	0.11	Off	Off	Off	Off
1080 RMP 1 Supply Volts	VDC	-23.88	Off	Off	Off	Off
1091 RMP 2 MTR Volts	VDC	-29.68	-29.7	-29.64	-29.63	-29.63
1092 RMP 2 MTR Current	Amps	0.10	0.10	0.10	0.10	0.10
1090 RMP 2 Supply Volts	VDC	-23.46	-23.4	-23.39	-23.39	-23.38
1220 SAD RT MTR WNDNG Volts	VDC	-5.0	-4.8	-4.36	-4.30	-4.32
1240 SAD LT MTR WNDNG Volts	VDC	-5.2	-4.8	-4.38	-4.42	-4.12
1227 SAD RT -15 VDC Conv.	VDC	-14.88	14.9	15.13	14.88	14.90
1247 SAD LT -15 VDC Conv.	VDC	-15.12	15.2	15.13	15.13	15.15
1056 CLB ± 6 VDC	TMV	2.33	2.4	2.35	2.35	2.35
1055 CLB ± 10 VDC TMV	TMV	2.73	2.75	2.75	2.75	2.75
1057 CLB Power Supply Volts	TMV	2.77	2.8	2.78	2.79	2.79
1261 THO2 EBP	DGC	23.0	22.9	26.00	26.69	26.42
1262 THO3 EBP	DGC	25.0	23.4	24.90	25.39	25.09
1263 THO1 STS	DGC	-8.0	-6.8	3.49	2.70	0.59
1264 THO2 STS	DGC	-11.0	-14.6	-6.49	-8.55	-8.81
1265 THO3 STS	DGC	-12.0	-3.1	12.04	11.92	9.32
1266 THO4 STS	DGC	4.0	-13.9	1.70	2.18	-2.55
1267 THO5 STS	DGC	-2.0	-8.9	7.89	6.20	-0.07
1224 SAD R FSST	DGC	28.0	39.5	-6.49	53.20	52.87
1244 SAD L FSST	DGC	22.0	27.1	43.87	44.23	45.64

(1)Scanner S/N FT-3 in thermo-vacuum scanner - S/N FT-6 in flight

* Thermal Vacuum Test Data

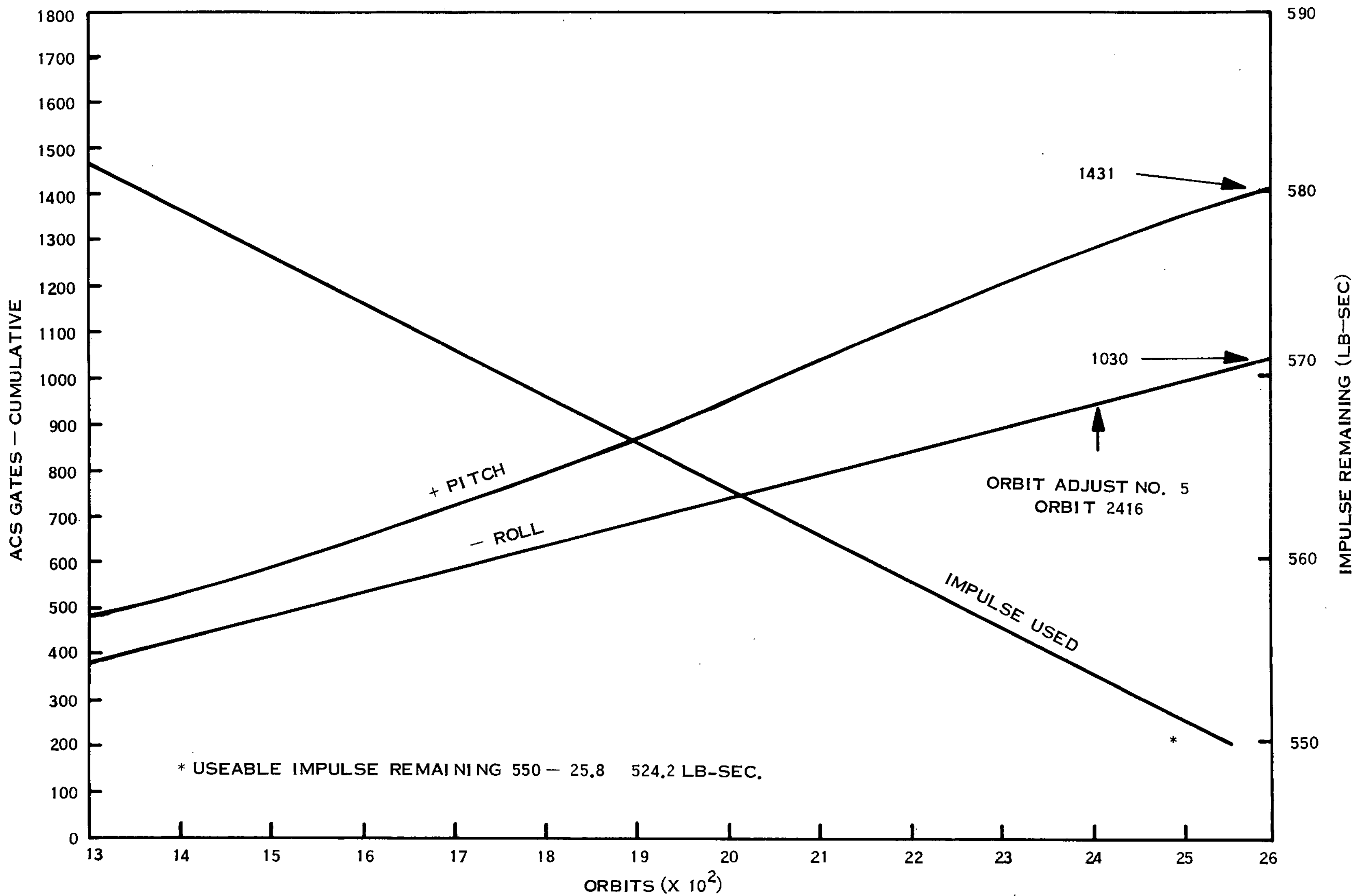


Figure 4-1. Cumulative Gate History ERTS 1

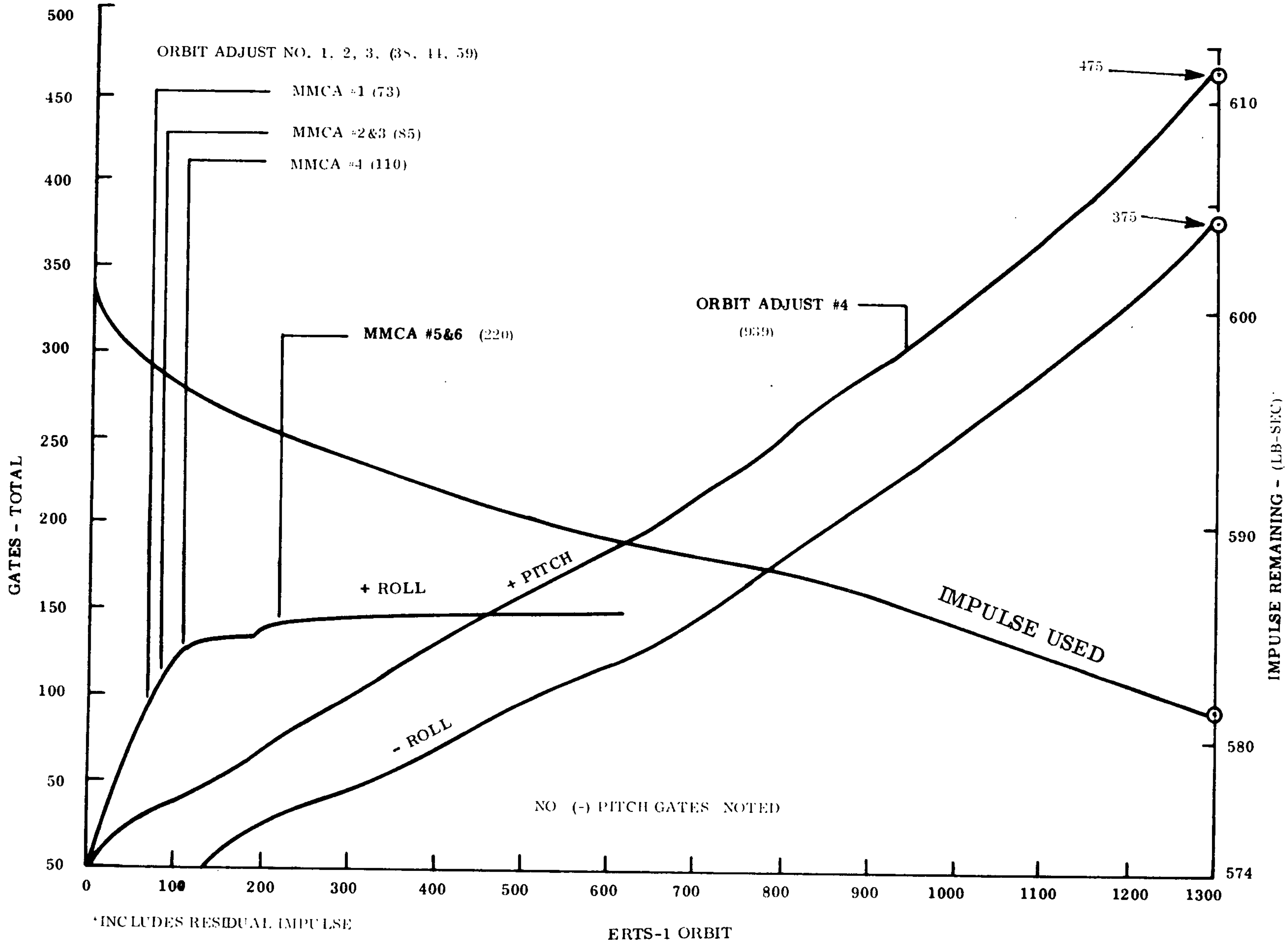


Figure 4-2. Cumulative Gate History ERTS 1

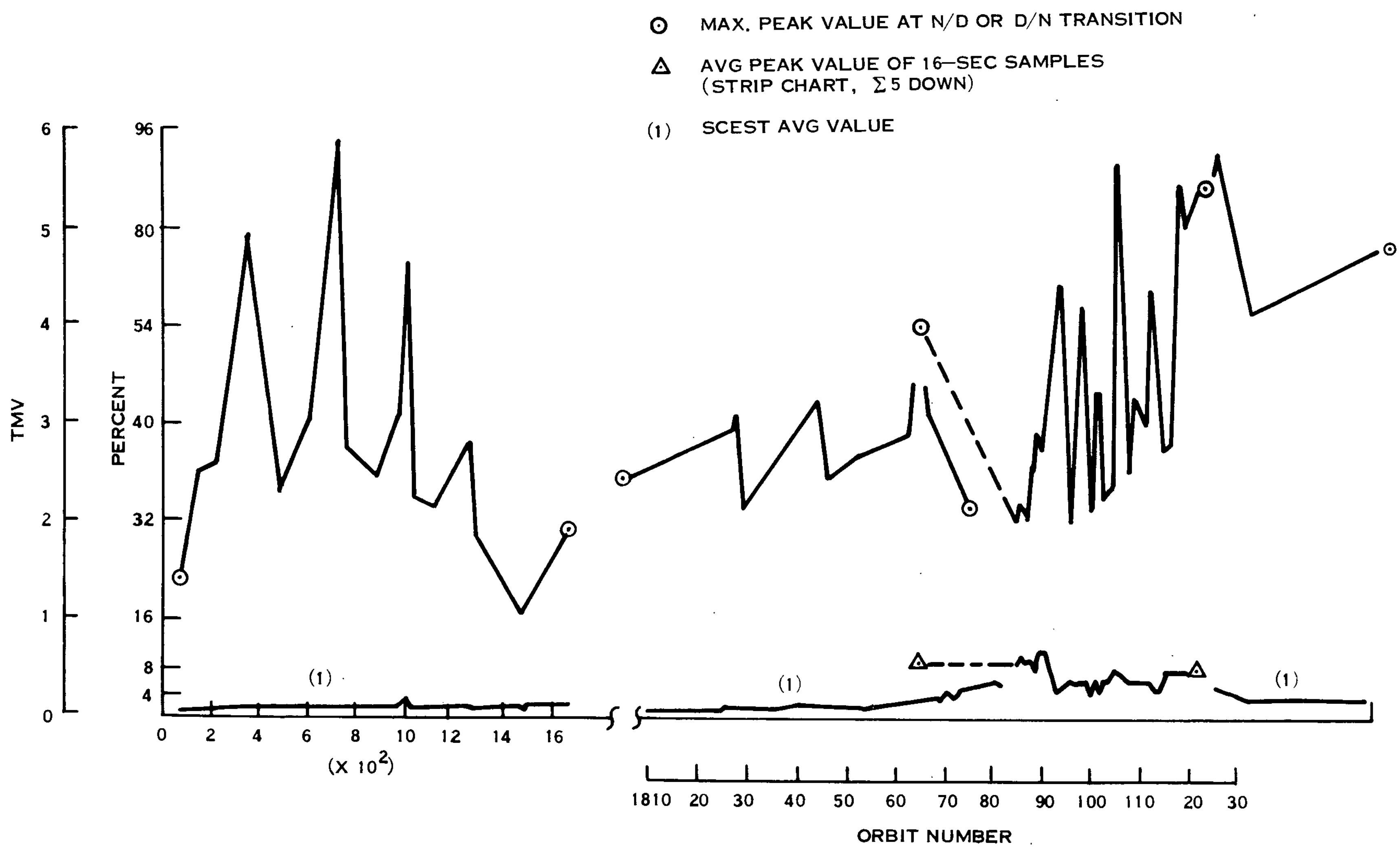


Figure 4-3. Yaw Motor Drive Duty Cycle (Func. 1033/1034)

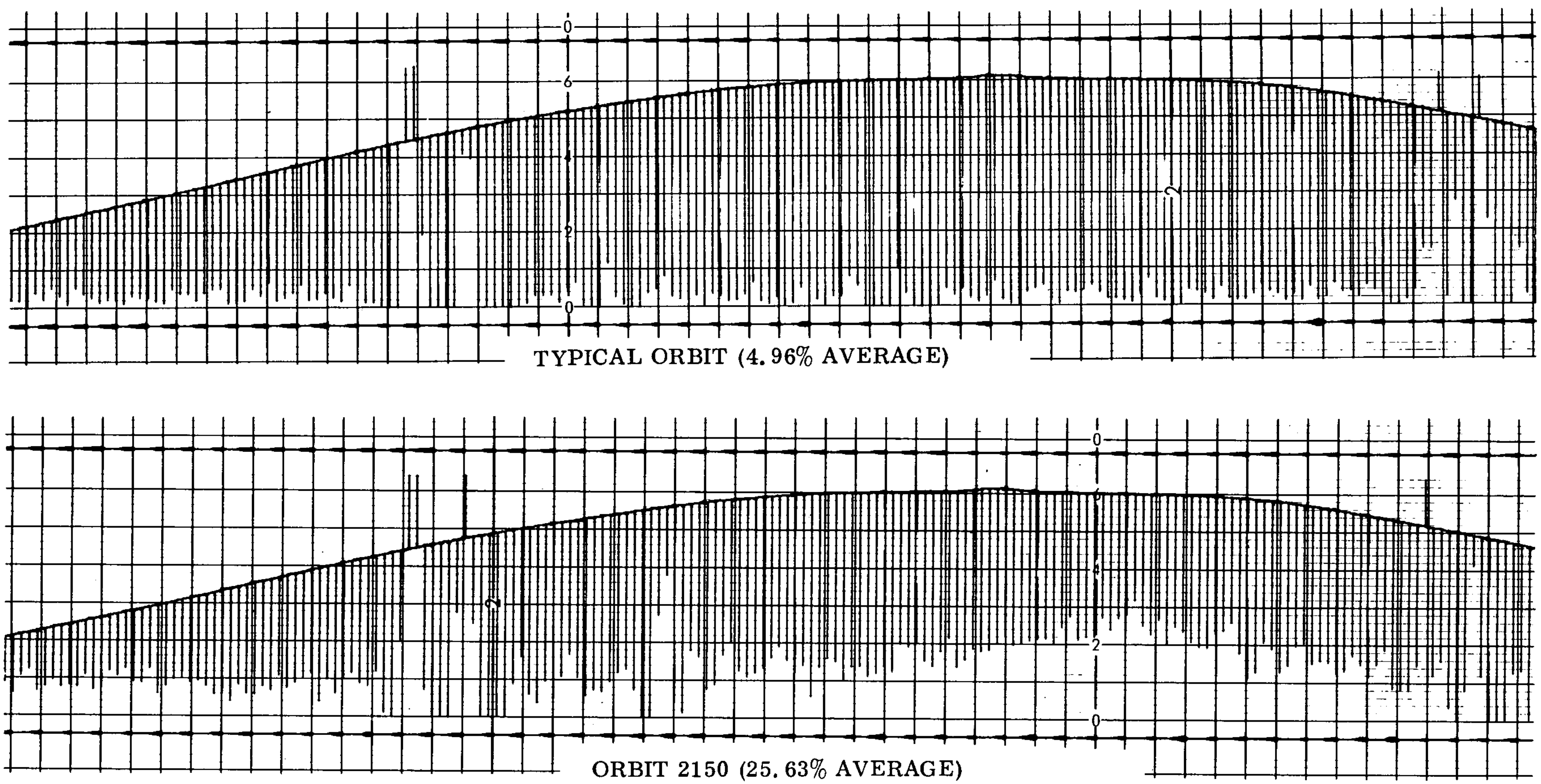


Figure 4-4. Pitch Flywheel Duty Cycle

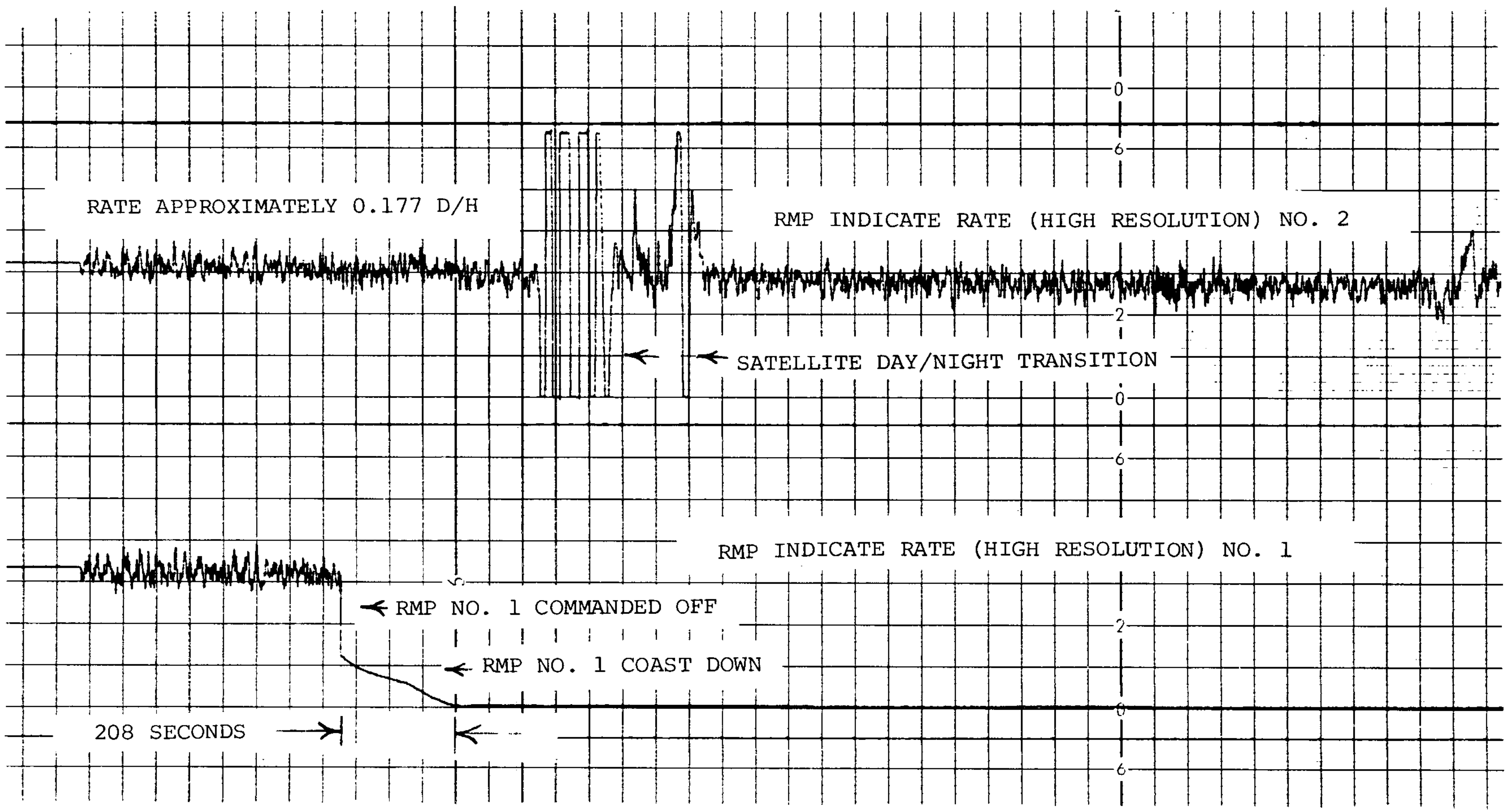


Figure 4-5. RMP No. 1 ("A") Coast Down Test Results (Orbit 2417)

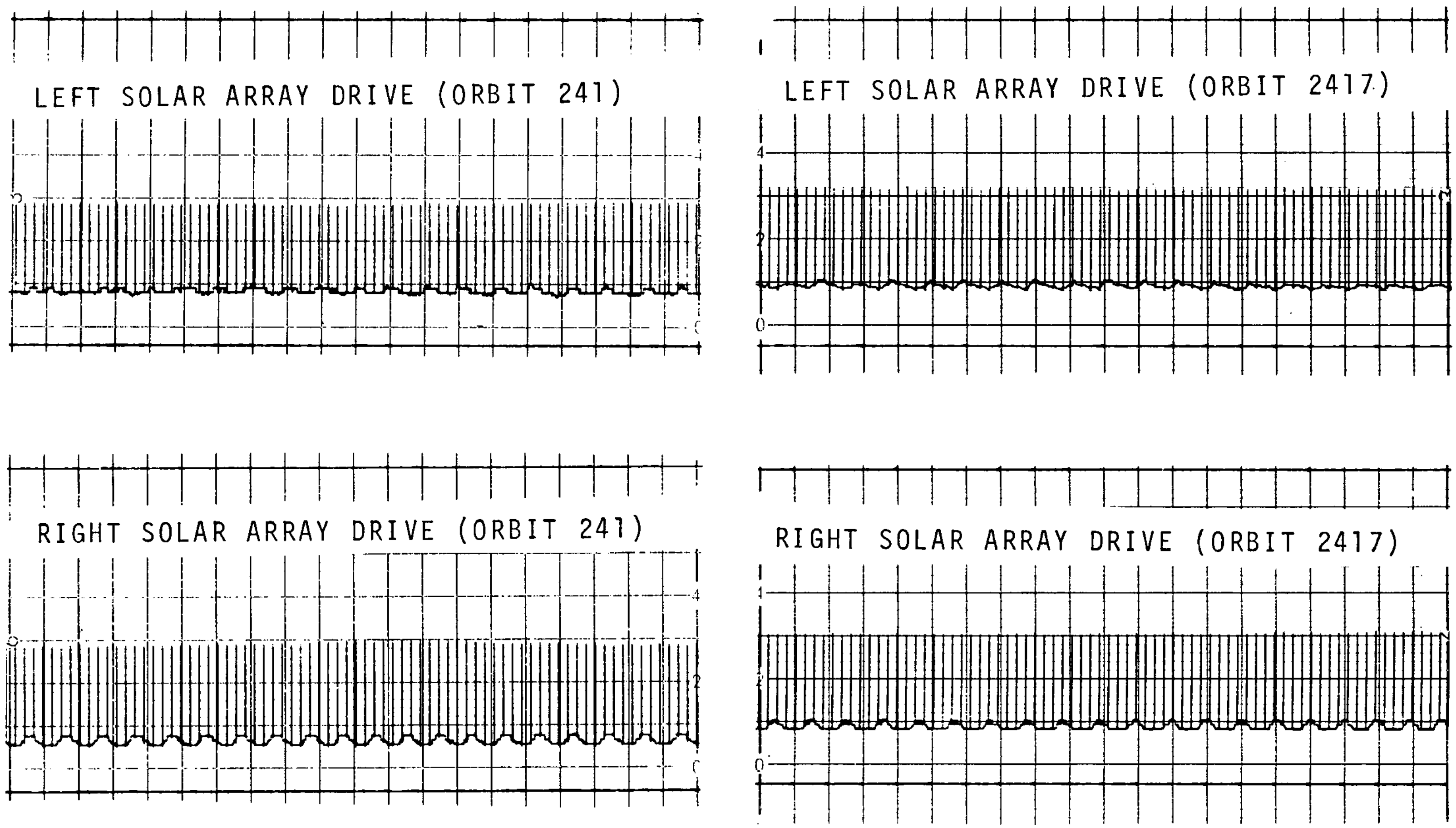


Figure 4-6. SAD Motor Winding Voltages and Sun Sensor Preamp (Typical Early Orbit and Recent Orbit)

SECTION 5

COMMAND/CLOCK SUBSYSTEM

Command processing for both real time and stored commands for ERTS-1 has been normal during this period except for one minor problem with one comstor cell which will be noted later.

Commanding difficulties which have been experienced have been isolated to ground transmission problems.

Several commands have been missed which were attributed to the logic race in the command clock design. This is expected for 1 in 10,000 commands. (See Appendix B, PIR 1J83-NE-759.) Six have been noted in approximately 52,000 commands. The time base provided by the S/C clock has been well within specifications during this period. Drift has averaged -1.18 m.s./orbit. The spacecraft clock was reset successfully on 1 January 1973. See Figure 5-1. Spacecraft time code transmitted via MSS and Telemetry has been reliable and accurate. All frequency outputs to other subsystems have been nominal.

There has been no occasion to switch to alternate units from original configuration.

In orbit 583 in the Bermuda pass during an attempted Comstor load cell 12 of Comstor B gave a return that was 256 seconds higher than entered. Cell 12 loaded with 525 "Inv A ON" for 14:57:20; verified as 525 for 15:01:36. The same Δ time was noted in Cell 12. Comstor B as listed in Table 5-1. In three cases noted the Δ time was 256 sec lower than entered. On second try Comstor loaded normally each time. This intermittent problem is under further investigation.

Table 5-2 gives typical telemetry values.

The VHF command Receiver-B has operated flawlessly since launch. Receiver A has not yet been used. Interference has frequently been observed in strip charts and telemetry data, but this has had no impact on the operational functions.

Table 5-1. Summary of Cell 12 Comstor 'B' (Δ Time 256 Sec)

Orbit	Δ Time	Station
583	H	Bermuda
635	H	Alaska
891	H	Greenbelt
1225	H	Greenbelt
1254	H	Greenbelt
1538	H	Greenbelt
1696	L	Alaska
1699	H	Greenbelt
1719	H	Alaska
1803	L	Greenbelt
1852	L	Bermuda
1983	H	Alaska
2189	H	Goldstone

H - Δ time 256 seconds higher than entered

L - Δ time 256 seconds lower than entered

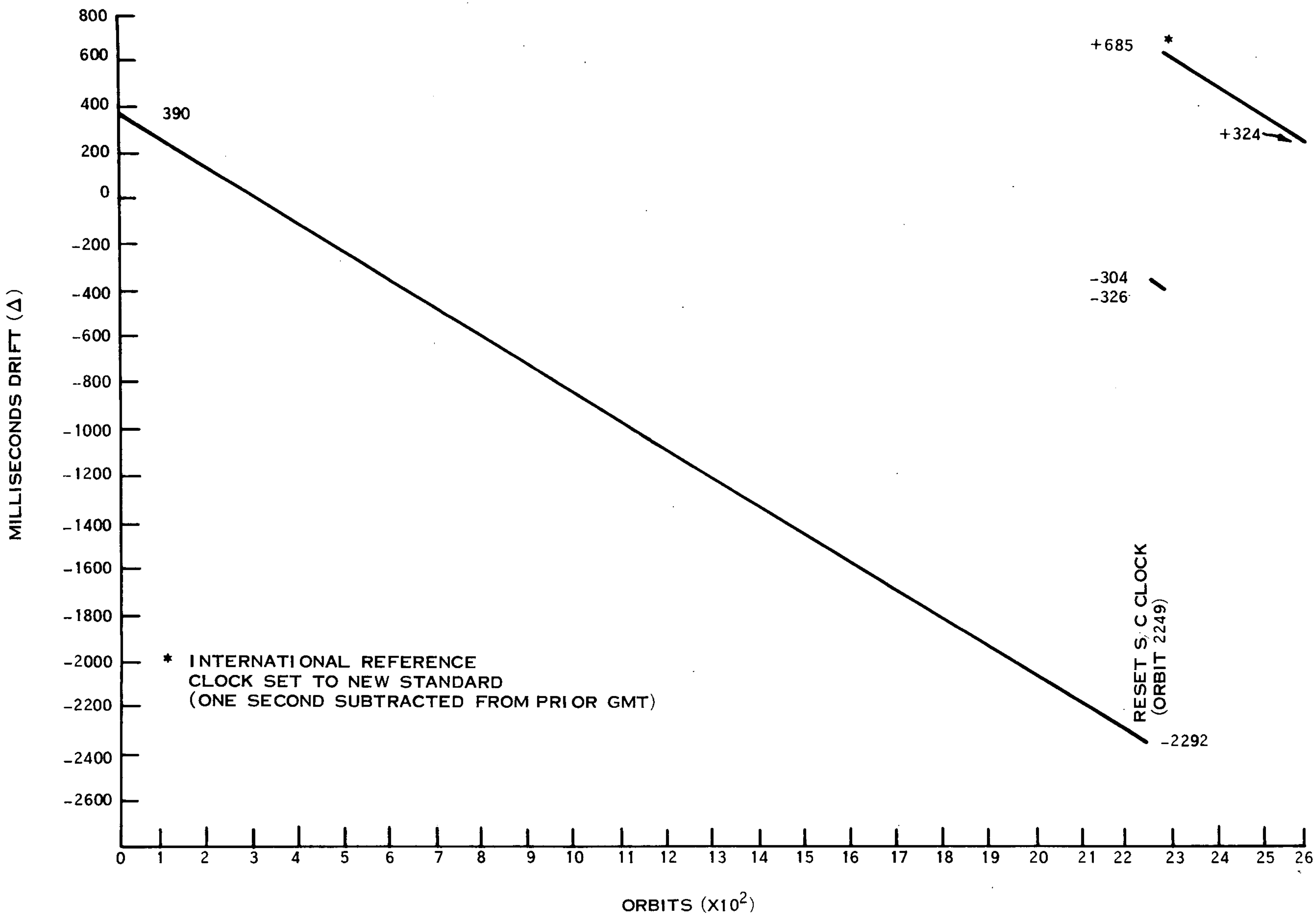


Figure 5-1. Command Clock Drift Summary

Table 5-2. Command/Clock Telemetry Summary

Function No.	Name	Mode	Units 20°C	* T/V Plateau	Orbit 35	Orbit 1799	Orbit 2201	Orbit 2600
8005	Pri. Power Supply Temp	-	°C	37.0	37.31	39.49	39.04	38.91
8006	Red. Power Supply Temp	-	°C	41.3	35.73	38.05	37.62	37.56
8007	Pri. Osc. Temp	-	°C	31.1	31.14	32.09	31.99	31.92
8008	Red. Osc. Temp	-	°C	30.3	30.47	31.41	31.40	31.31
8009	Pri. Osc. Output	-	TMV	1.07	0.95	0.96	0.96	0.96
8010	Red. Osc. Output	-	TMV	0.98	**	**	**	**
8011	100 kHz	Pri. - Red.	TMV	3.10	3.11	3.11	3.11	3.11
8012	10 kHz	Pri. - Red.	TMV	3.07	3.10	3.08	3.08	3.08
8013	2.5 kHz	Pri. - Red.	TMV	2.95	2.95	2.95	2.95	2.95
8014	400 Hz	Pri. - Red.	TMV	4.40	4.40	4.40	4.40	4.40
8015	Pri. +4V Power Supply	Pri. Clk ON	VDC	4.10	4.10	4.10	4.10	4.10
8016	Red. +4V Power Supply	Red. Clk ON	VDC	3.98	3.95	3.95	3.95	3.95
8017	Pri. +6V Power Supply	Pri. Clk ON	VDC	6.07	6.06	6.07	6.07	6.08
8018	Red. +6V Power Supply	Red. Clk ON	VDC	5.95	6.00	5.94	5.94	5.95
8019	Pri. -6V Power Supply	Pri. Clk ON	VDC	-6.02	-6.02	-6.03	-6.02	-6.03
8020	Red. -6V Power Supply	Red. Clk ON	VDC	-6.02	-5.99	-6.00	-6.00	-6.00
8021	Pri. -23V Power Supply	Pri. Clk ON	VDC	-22.96	-22.88	-22.89	-22.89	-22.90
8022	Red. -23V Power Supply	Red. Clk ON	VDC	-23.0	-22.98	-23.00	-23.01	-23.02
8023	Pri. -29V Power Supply	Pri. Clk ON	VDC	-29.2	-29.13	-29.07	-29.15	-29.14
8024	Red. -29V Power Supply	Red. Clk ON	VDC	-29.2	-29.07	-29.21	-29.21	-29.21
8101	CIU A -12V	CIU A ON	VDC	-12.3	-12.33	-12.33	-12.33	-12.33
8102	CIU B -12V	CIU B ON	VDC	-12.2	-12.26	-12.26	-12.26	-12.26
8103	CIU A -5V	CIU A ON	VDC	-5.34	-5.32	-5.34	-5.34	-5.34
8104	CIU B -5V	CIU B ON	VDC	-5.30	-5.31	-5.31	-5.31	-5.31
8105	CIU A Temp	CIU A ON	°C	24.3	24.47	25.13	24.85	24.85
8106	CIU B Temp	CIU B ON	°C	24.6	24.96	25.67	25.36	25.42
8201	Receiver RF-A Temp	-	°C	29.0	**	**	**	**
8202	Receiver RF-B Temp	-	°C	28.5	27.98	28.53	28.44	28.46
8203	D MOD A Temp	-	°C	37.5	25.41	25.90	25.99	25.82
8204	D MOD B Temp	-	°C	35.4	35.03	35.61	35.75	35.59
8205	Receiver A AGC	Receiver A ON	DBM	-70.0	**	**	**	**
8206	Receiver B AGC	Receiver B ON	DBM	-57.0	-94.74	-92.10	-88.28	-89.91
8207	Amp. A Output	Receiver A ON	RMV	1.50	**	**	**	**
8208	Amp B Output	Receiver B ON	TMV	1.54	2.81	2.96	3.08	2.81
8209	Freq. Shift Key A OUT	Receiver A ON	TMV	1.11	**	**	**	**
8210	Freq. Shift Key B OUT	Receiver B ON	TMV	1.10	1.10	1.10	1.10	1.10
8211	Amp. A Output	Receiver A ON	TMV	1.11	**	**	**	**
8212	Amp. B Output	Receiver B ON	TMV	1.13	1.13	1.13	1.13	1.14
8215	D MOD A -15V	Receiver A ON	TMV	4.98	**	**	**	**
8216	D MOD B -15V	Receiver B ON	TMV	4.99	5.00	5.00	5.00	5.00
8217	Regulator A -10V	Receiver A ON	TMV	5.39	**	**	**	**
8218	Regulator B - 10V	Receiver B ON	TMV	5.50	5.50	5.50	5.50	5.50

* Thermal Vacuum Test Data

** A component not used since prelaunch

SECTION 6

TELEMETRY SUBSYSTEM

The telemetry Subsystem was launched in the ON mode and has been operating continuously since then providing data from the spacecraft either to ground stations, the narrow band recorders, or both. Typical telemetry values are given in Table 6-1. Only memory section 0, 0 has been used in the telemetry matrix. Total performance has been excellent.

Table 6-1. TLM Telemetry Summary

Function No.	Function Name	Unit	T/V* 20°C Plateau	Orbit 35	Orbit 1799	Orbit 2201	Orbit 2600
9001	Memory Sequencer A Converter	VDC	6.34	6.35	6.33	6.33	6.34
9002	Memory Sequencer B Converter	VDC	6.44	**	**	**	**
9003	Memory Sequencer Temp	°C	20.1	19.59	21.24	21.69	21.47
9004	Formatter A Converter	VDC	5.99	5.99	5.99	5.99	5.99
9005	Formatter B Converter	VDC	6.02	**	**	**	**
9006	Dig. Mux A Converter	VDC	10.02	10.01	10.04	10.07	10.07
9007	Dig. Mux B Converter	VDC	10.01	**	**	**	**
9008	Formatter/Dig. Mux Temp	°C	22.2	22.50	25.00	26.01	27.34
9009	Analog Mux A Converter	VDC	26.18	26.01	26.18	26.18	26.18
9010	Analog Mux B Converter	VDC	26.21	**	**	**	**
9011	A/D Converter A Voltage	VDC	10.00	10.00	10.06	10.07	10.07
9012	A/D Converter B Voltage	VDC	10.06	**	**	**	**
9013	Analog Mux. A/D Converter Temp	°C	26.7	25.00	27.27	27.50	27.50
9014	Preregulator A Voltage	VDC	19.91	19.93	19.96	19.99	19.99
9015	Preregulator B Voltage	VDC	19.88	**	**	**	**
9016	Reprogrammer Temp	°C	19.9	22.0	23.59	24.88	25.00
9017	Memory A Converter	VDC	6.00	6.00	6.00	6.00	6.00
9018	Memory A Temp	°C	19.3	17.51	17.52	18.51	19.06
9019	Memory B Converter	VDC	6.03	**	**	**	**
9020	Memory B Temp	°C	17.4	17.68	18.16	19.04	19.29
9100	Reflected Power (Xmtr A)	dBm	0	11.95	12.46	12.38	12.75
9101	Xmtr A -20 VDC	VDC	-19.76	-19.75	-19.76	-19.76	-19.78
9102	Xmtr B -20 VDC	VDC	-19.79	**	**	**	**
9103	Xmtr A Temp	°C	20.5	20.95	22.00	22.46	24.06
9104	Xmtr B Temp	°C	20.0	21.69	22.77	23.31	25.02
9105	Xmtr A Power Output	dBm	25.48	25.12	25.36	25.36	25.36
9106	Xmtr B Power Output	dBm	25.84	**	**	**	**

* Thermal Vacuum Test Data
** Units not used since prelaunch

SECTION 7

ORBIT ADJUST SUBSYSTEM (OAS)

A fifth orbit adjust burn was performed during orbit 2416 for the purpose of maintaining a satisfactory ground track. The OAS heaters were turned on during orbit 2415 at 22:22:01 and off prior to the burn. The OAS and the (-)x thruster were turned on at 00:21:31 and off at 00:21:52. All commands were backed up in COMSTOR for a firing period of 20.4 seconds. Figure 7-1 shows performance characteristics. Tracking data for the fifth burn is given in Table 7-1. Table 7-2 is a summary of OAS performance to date and Table 7-3 gives average telemetry values for the off quiescent state.

Table 7-1. ERTS-1 Brouwer Mean Elements

Parameter	Pre-burn	Post-burn
Apogee (Km)	920.597	920.738
Perigee (Km)	894.515	894.686
SMA (Km)	7285.723	7285.877
Inclination (Deg)	99.093	99.093
Eccentricity	.00179	.00179
Mean Anomaly (Deg)	229.008	39.512
Argument of Perigee (Deg)	109.442	140.302
RAAN (Deg)	77.982	80.002
Nodal Period (Min)	103.266	103.269
Epoch	12 Jan 73 20:57:45.8	14 Jan 73 21:09:16.6

Table 7-2. Orbit Adjust Performance

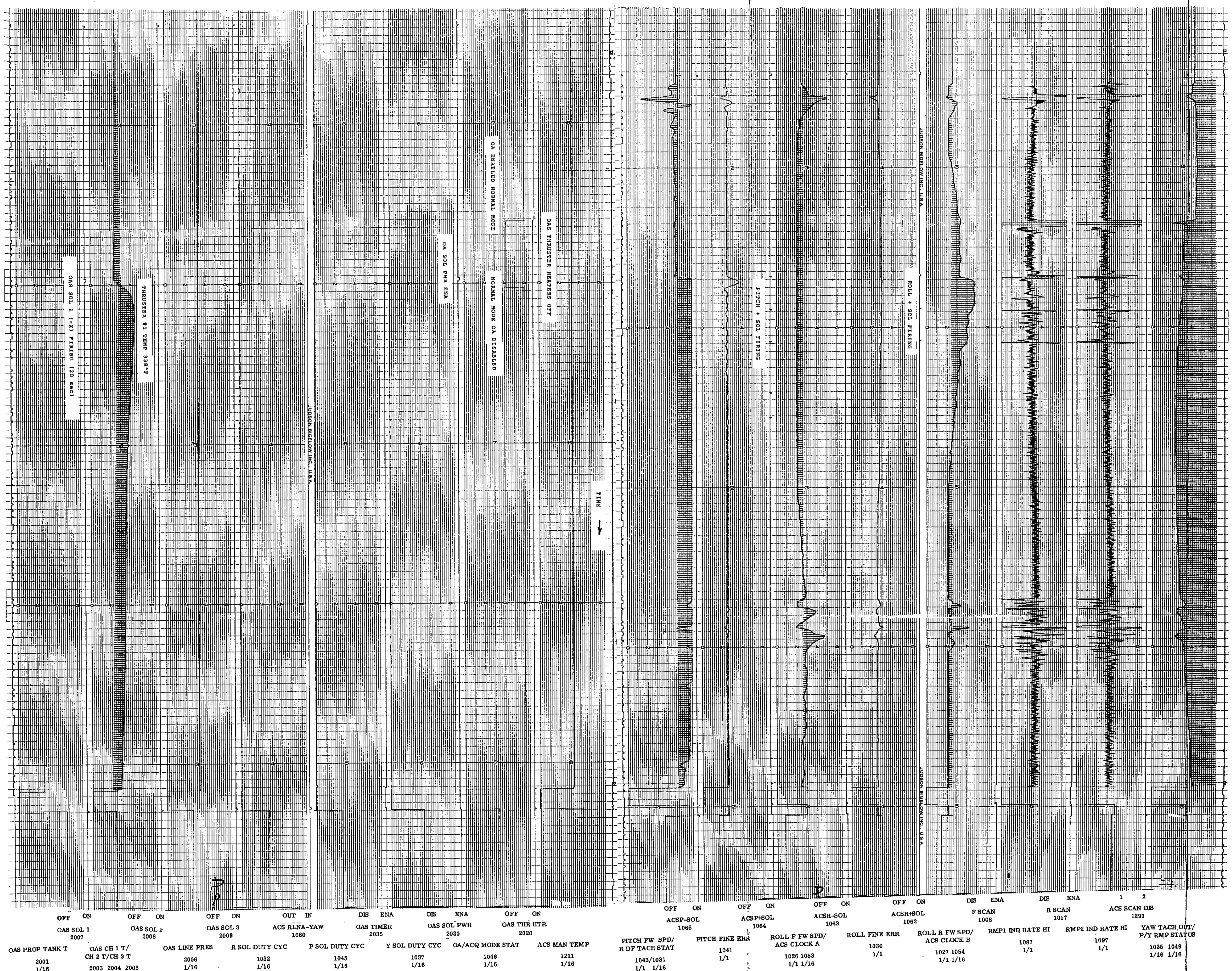
Orbit	Burn Time (sec)	Average Sma (2) (KM)	Performance % of Plan	N_2H_4 Used # (3)
(1)	-	7281.461	-	-
38	4.8	7281.484	60.0	0.018
44	251.0	7283.456	103.5	0.934
59	318.0	7285.838	101.5	1.19
938	12.8	7285.877	110.0	0.044
2416	20.4	7285.877	106.0	0.076
	Average Force 0.81 LB_f			

(1) After Injection
(2) Semi-Major Axis
(3) Initial fuel load 67.0 pounds

Table 7-3. OAS Telemetry Values

Function No.	Name	Units	*T/V 20^oC Plateau	Orbit 35	Orbit 1799	Orbit 2201	Orbit 2600
2001	Prop. Tank Temp.	^oC	18.2	22.03	23.81	23.72	23.91
2003	Thrust Chamber No. 1 (-x) Temp.	^oC	20.9	29.57	34.22	27.60	28.50
2004	Thrust Chamber No. 2 (+x) Temp.	^oC	19.7	38.76	36.93	41.21	37.44
2005	Thrust Chamber No. 3 (-y) Temp.	^oC	18.9	34.55	40.63	42.95	46.23
2006	Line Pressure	Psia	4.0	539.29	486.86	487.17	486.87

* Thermal Vacuum Test Data



FOLDOUT FRAME 1

FOLDOUT FRAME 2

Figure 7-1. Orbit Adjust Subsystem Performance Characteristics

SECTION 8

MAGNETIC MOMENT COMPENSATING ASSEMBLY (MMCA)

The spacecraft was corrected for unbalanced magnetic moments in orbits 73, 85, 110 and 220. Adjustments were made in the pitch positive. The unit responded well as noted in Table 8-1 and has held its charge. The current dipole values are Pitch + 2950 Pole-Cm, roll zero, yaw zero. These values are unchanged since Orbit 220. Table 8-2 gives typical telemetry for the MMCA.

Table 8-1. MMCA Telemetry Before and After Adjustment

		Orbits							
Function	Units	72	75	83	88	106	115	218	224
4003	TMV	3.49	3.48	3.48	3.48	3.47	3.49	3.50	3.50
4004	TMV	3.11	3.11	3.11	3.11	3.11	3.11	3.11	3.11
	Pole-Cm	≈0	≈0	≈0	≈0	≈0	≈0	≈0	≈0
4005	TMV	3.13	2.87	2.87	2.77	2.77	2.65	2.65	2.52
	Pole-Cm	≈0	1200	1200	1800	1800	2350	2350	2950
4006	TMV	3.18	3.20	3.20	3.20	3.18	3.18	3.18	3.18
	Pole-Cm	≈0	≈0	≈0	≈0	≈0	≈0	≈0	≈0

Table 8-2. MMCA Telemetry Summary

Number	Name	Units	T/V 20°C* Plateau	Orbit 35	1799	2201	2600
4001	A1 Board Temp	°C	19.8	19.77	19.54	19.54	19.37
4002	A2 Board Temp	°C	23.6	23.58	23.43	23.38	23.36
4003	Hall Current	TMV	3.50	3.48	3.49	3.49	3.49
4004	Yaw Flux Density	TMV	3.07	3.11	3.06	3.06	3.10
4005	Pitch Flux Density	TMV	3.12	3.13	2.51	2.50	2.50
4006	Roll Flux Density	TMV	3.22	3.19	3.17	3.18	3.20

SECTION 9

UNIFIED S-BAND/PREMODULATION PROCESSOR

The Unified S-Band Subsystem (USB) has operated satisfactorily since separation, late in Orbit Zero.

The USB receiver has been ON continuously since launch for a total of 4474 hours, available to any USB ground station for reception of commands and ranging interrogation. Only Receiver A has been used to date.

The USB transmitter has been ON for 592 hours (13% of the time) available on command for transmission of telemetry, DCS information, and ranging data. Only transmitter A has been used to date.

Table 9-1 lists telemetry values for orbits in this reporting period. All functions have maintained their original value except for transmitter power output, which has decreased from a value of 1.60 watts at launch to a value of 0.60 watts at orbit 2600. Figure 9-1 shows the power output history with its abrupt step-downs in orbits 808, 988, 1256, 2083, and 2526.

For a nominal 1 watt power output for the USB, the margins for the worst case have been computed to be:

Carrier	24 dB drop
1 kilobit modulation	17 dB drop
24 kilobit modulation	13 dB drop
DCS modulation	6 dB drop

The DCS margin is considered soft, however, and could be as much as 10 dB. The 6 dB decline equates to a power output of 0.25 watts, and the 10 dB decline equates to a power

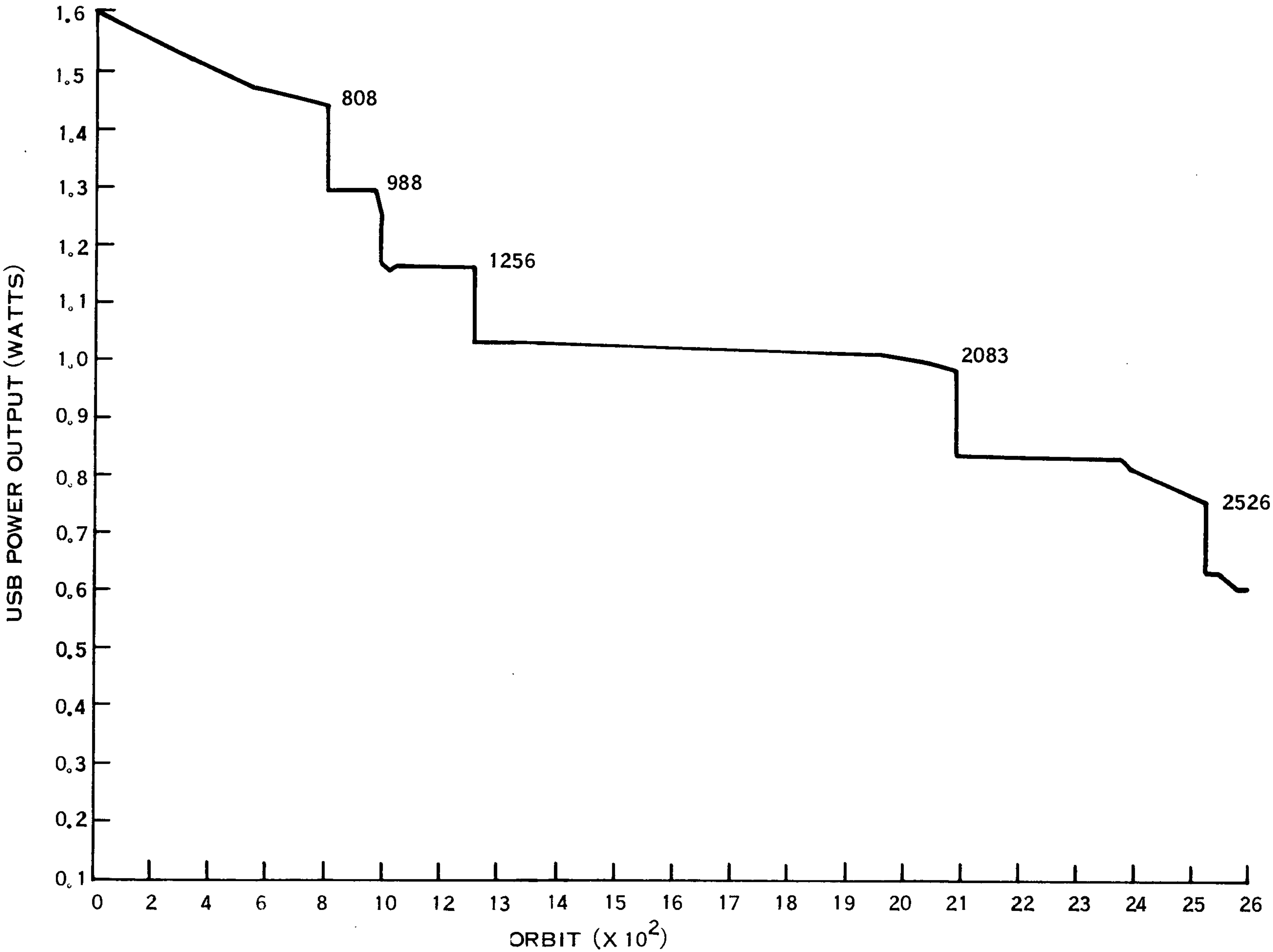


Figure 9-1. USB Power Output

output of 0.1 watt. A power output of 0.20 watts may then be used as the value requiring consideration of corrective action.

The average power decrease per 100 orbits has been 38.5 milliwatts. A continuation of this average rate of decline would reduce the power output to 0.20 watts in another thousand orbits-- early April 1973. The rate of power decline since orbit 2400 has been 120 milliwatts per hundred orbits. If this rate of decline is continued, the output could decrease to 0.20 watts in 400 orbits--late February 1973. It appears likely, therefore, that DCS quality will reach marginal values between late February and early April 1973 and will require a shift to the B transmitter of the USB unit.

Table 9-1. USB/PMP Telemetry Values

Function			Telemetry Value				
No.	Name		*TV	35	1699	2139	2566
11001	USB Revr. AGC	DBM	-127.24	-122.78	-127.58	-125.89	-126.18
11002	USB Trans. Pwr	WTS	1.60	1.60	1.03	0.84	0.62
11003	Receiver Error	KHZ	-24.33	-21.79	-21.28	-23.01	-20.87
11004	Transp. Temp.	DGC	20.37	22.92	23.31	24.34	25.30
11005	Transp. Pressure	PSI	15.68	15.91	15.96	16.02	16.09
11007	Trans A-15VDC	VDC	-15.16	-15.20	-15.20	-15.20	-15.20
11009	Ranging -15VDC	VDC	-14.76	-14.76	-14.76	-14.76	-14.76
11101	PMP A Volt	VDC	-15.21	-15.12	-15.23	-15.11	-15.18
11103	PMP A Temp.	DGC	23.14	30.44	31.10	32.80	33.70

*Thermal Vacuum Test Data; from EAB-FT-1 (unit changed to EAB-FT-2 for flight).

NOTE: Only "A" Unit has been turned on.

During Orbit 2083, the USB power output stepped down during a transmission period for the first time, so that the playback telemetry shows the step-down on the strip chart. See Figure 9-2.

Table 9-2 is a section of the computer printout--Data Listing Program (DLP)--from telemetry showing the time bracket of the power step-down in Orbit 2526. The data was played back in Orbit 2527 as can be seen from the header. The left hand column gives the time of the data: Julian day 20 (20 January 1973) plus hours, minutes and seconds. The next column gives the major frame and minor frame numbers (reference the header) in the telemetry matrix. The third column gives telemetry values for the USB transmitter power output function 11002 which is in column 18 row 64 of the telemetry matrix. The values are indicated "low" by the "L" entry from an arbitrary value inserted before launch in the DLP software program. The values are printed out only when they change; and associated with the print-out after the slash mark is the number of major frames of the prior reading before the change. The last column is the static phase error values. The corrected value of the power output is circled just below the value printed out from the original calibration curve. It can be seen from the data that between 21:19:35 and 21:23:51 the power output declined from 0.77 to 0.75 watts where it remained until after 21:55:11. Between 21:25:11 and 21:25:27 the power output dropped to 0.65 watts, the step-down shown in Figure 9-1. The plotted values shown in Figure 9-1 are average values for the orbit, and hence do not reveal the detail of the DLP, nor can correspondence in value be made directly.

Figure 9-3 is a strip chart of the AGC reading at Alaska during the step-down in Orbit 2526. As can be seen, the AGC reading decreased from 8.0 to 7.8, equivalent to a dbm reading of -79 to -80, which is about equal to the power drop of 0.8 db from 0.77 to 0.65 watts. As the spacecraft receded from the ground station, the AGC level decreased as can be seen. Minor effects of antenna pattern may also be seen.

Figure 9-4 shows the original and revised calibration curve for the USB Power output. These curves are useful in correcting the computer programs which still use the original calibration curve.

Figure 9-5 shows the AGC levels as recorded at Alaska (ULA), Goldstone (GDS) and Greenbelt (ENT). Alaska uses an 85-foot antenna and cooled receivers. This yields a net advantage to Alaska of about 8 db. Goldstone reports slightly higher AGC readings than does Greenbelt, for reasons not yet determined. Of interest is a fourth trace on Figure 9-5 showing the AGC readings at Alaska for Orbits 2500 to 2600 only. This trace is about 2 db below the average AGC readings for Orbits 1300 to 2600, reflecting the successive power drops.

The pressure/temperature ratio of the USB unit has remained practically constant as shown by Figure 9-6, dropping from 0.0549 in Orbit 35 to 0.0545 in Orbit 2600.

Table 9-2. Data Listing Program

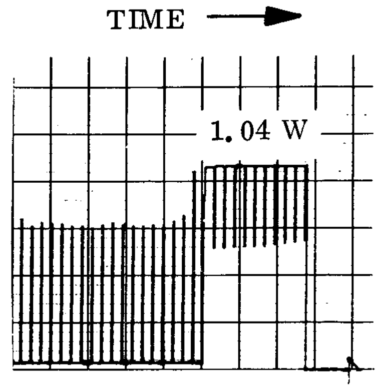
DATA LISTING PRGRM   ERTS-A FLT ØRBIT NØ. 0025271A SØURCE
DATA ØRIGIN 20 JAN. 73 FRØM 21/19/35 (0C1) TØ 23/01/43 (384)

TIME DDD/HH/MM/SS	MAJØR FRAME	XMTR PWR WTS 18/64 110C2	RCVR ERR KHZ 1/74 11003
C20/21/19/35	1- 1	.67L/ 0	-17.66 / 0
C20/21/19/51	2- 1	0.79	-19.26 / 1
C20/21/20/07	3- 1		-22.47 / 1
C20/21/20/23	4- 1		-20.87 / 1
C20/21/20/39	5- 1		-22.47 / 1
C20/21/20/55	6- 1		-19.26 / 1
C20/21/21/11	7- 1		-20.87 / 1
C20/21/21/27	8- 1	.66L/ 7	
C20/21/21/43	9- 1	0.77	-19.26 / 2
C20/21/22/15	11- 1		-17.66 / 2
C20/21/22/31	12- 1		-22.47 / 1
C20/21/23/03	14- 1		-20.87 / 2
C20/21/23/19	15- 1		-22.47 / 1
C20/21/23/35	16- 1		-20.87 / 1
C20/21/23/51	17- 1	.65L/ 9	-24.07 / 1
C20/21/24/07	18- 1		-16.05 / 1
C20/21/24/23	19- 1	0.75	-24.07 / 1
C20/21/24/55	21- 1		-22.47 / 2
C20/21/25/11	22- 1		-19.26 / 1
C20/21/25/27	23- 1	.55L/ 6	-24.07 / 1
C20/21/25/43	24- 1	0.65	-20.87 / 1
C20/21/26/15	26- 1		-22.47 / 2
C20/21/26/31	27- 1		-24.07 / 1
C20/21/26/47	28- 1	.55L/ 5	-19.26 / 1
C20/21/27/03	29- 1	0.65	-22.47 / 1
C20/21/27/19	30- 1		-19.26 / 1
C20/21/27/51	32- 1		-20.87 / 2
C20/21/28/07	33- 1		-24.07 / 1
C20/21/28/23	34- 1		-17.66 / 1
C20/21/28/39	35- 1		-19.26 / 1
C20/21/28/55	36- 1		-16.05 / 1
C20/21/29/11	37- 1		-20.87 / 1
C20/21/29/27	38- 1		-17.66 / 1
C20/21/29/43	39- 1	.C2L/ 11	-20.87 / 1
C20/21/29/59	40- 1	.C2 / 1	-24.07 / 1
C20/21/30/15	41- 1		-20.87 / 1
C20/21/30/31	42- 1		-22.47 / 1
C20/21/30/47	43- 1		-24.07 / 1
C20/21/31/03	44- 1		-22.47 / 1
C20/21/31/35	46- 1		-17.66 / 2

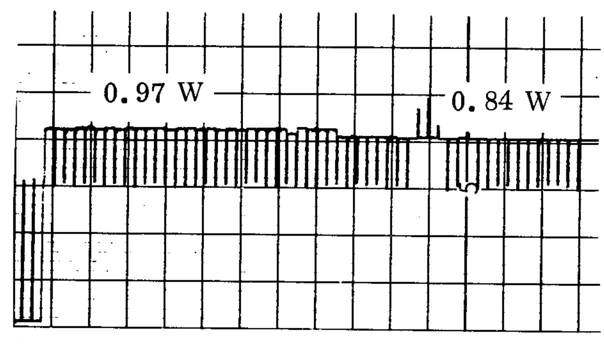
FOLDOUT FRAME 1

FOLDOUT FRAME 2

ORBIT 2082 LEAVES ORBIT
WITH USB POWER
4.35 TMV = 1.04 WATTS



ORBIT 2083
POWER STEP-DOWN IN ORBIT
FROM 4.25 TMV = 0.97 WATTS TO
4.08 TMV = 0.84 WATTS



ORBIT 2084
ENTERS ORBIT WITH USB POWER
= 4.08 TMV = 0.84 WATTS

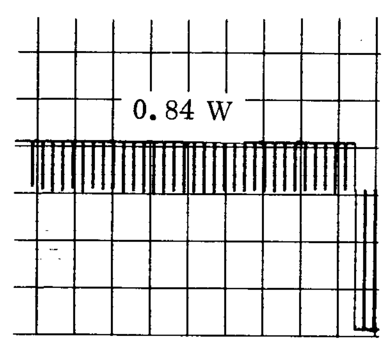


Figure 9-2. USB Power Output

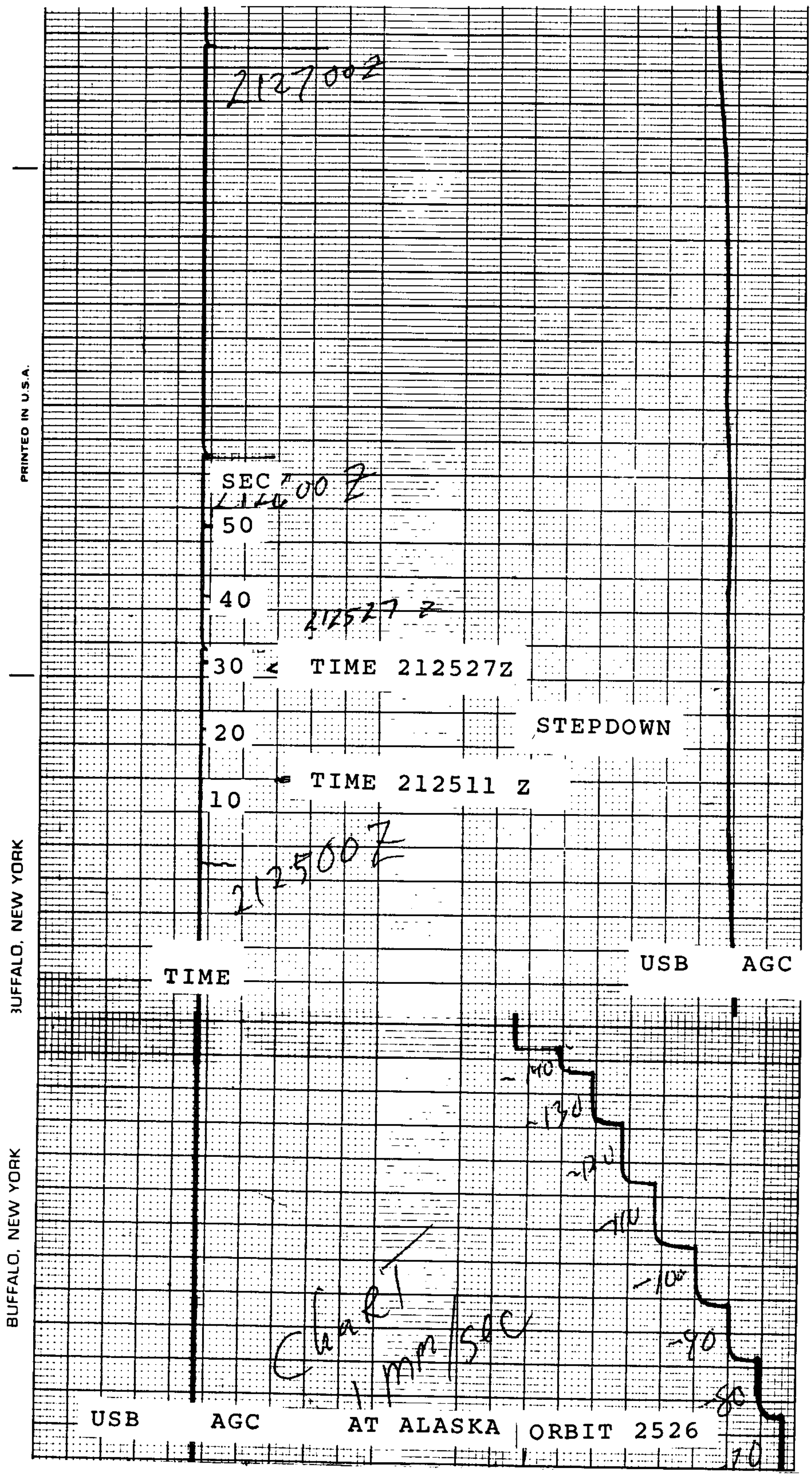


Figure 9-3. Strip Chart of AGC Power from Alaska Site

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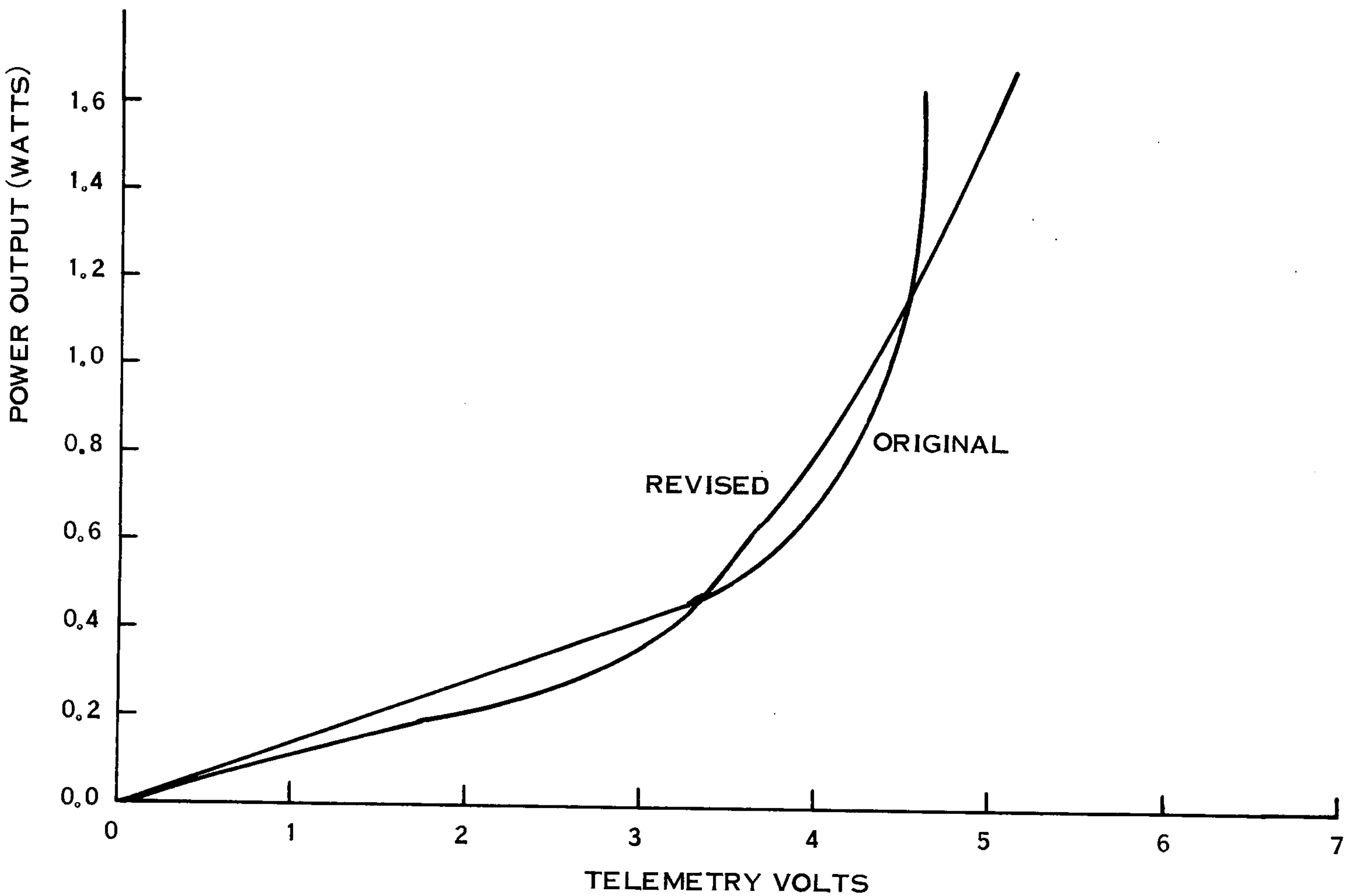


Figure 9-4. USB Calibration Curves - Original and Revised

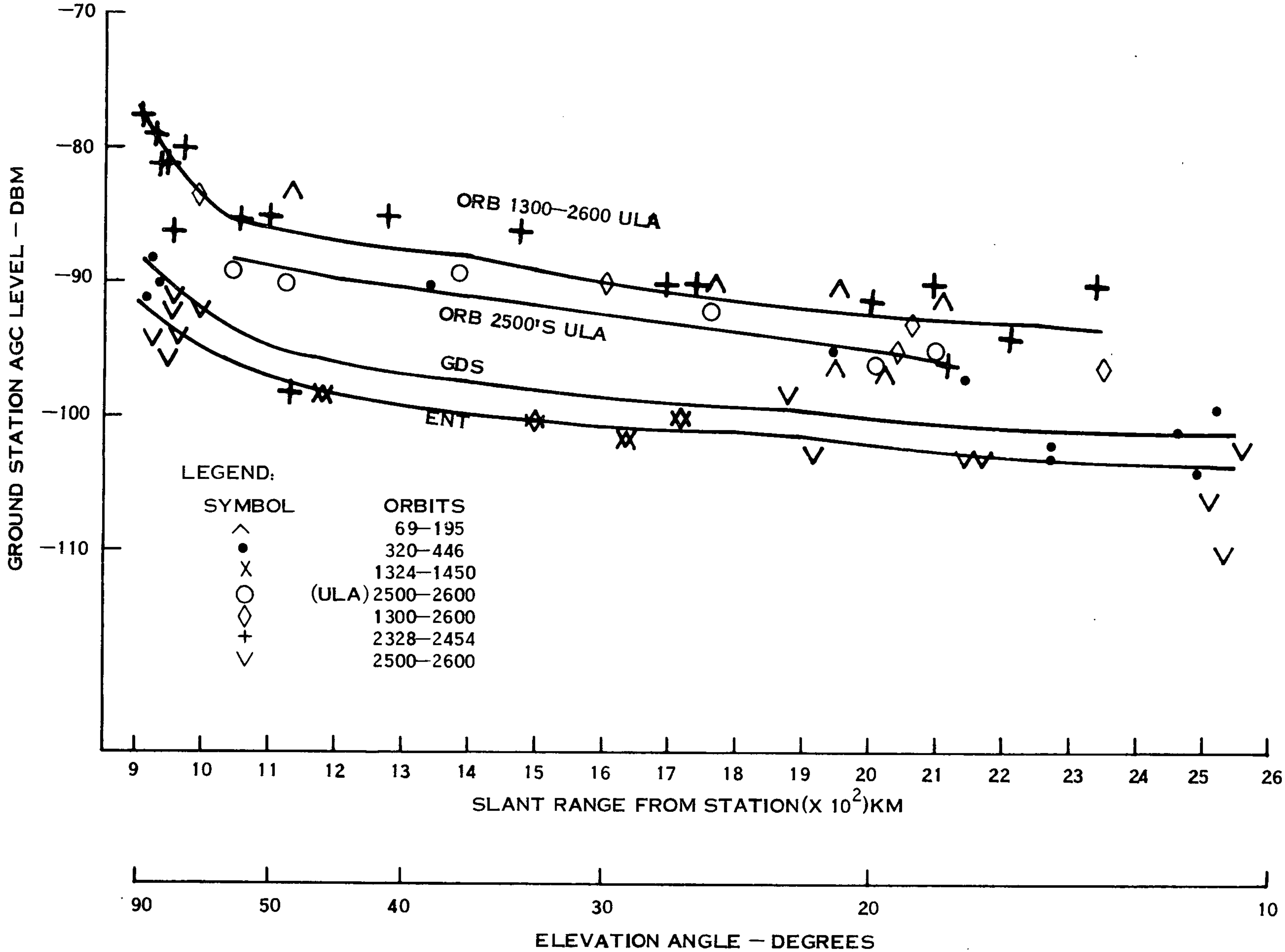


Figure 9-5. Maximum AGC Levels During Orbit as Recorded in Ground Station

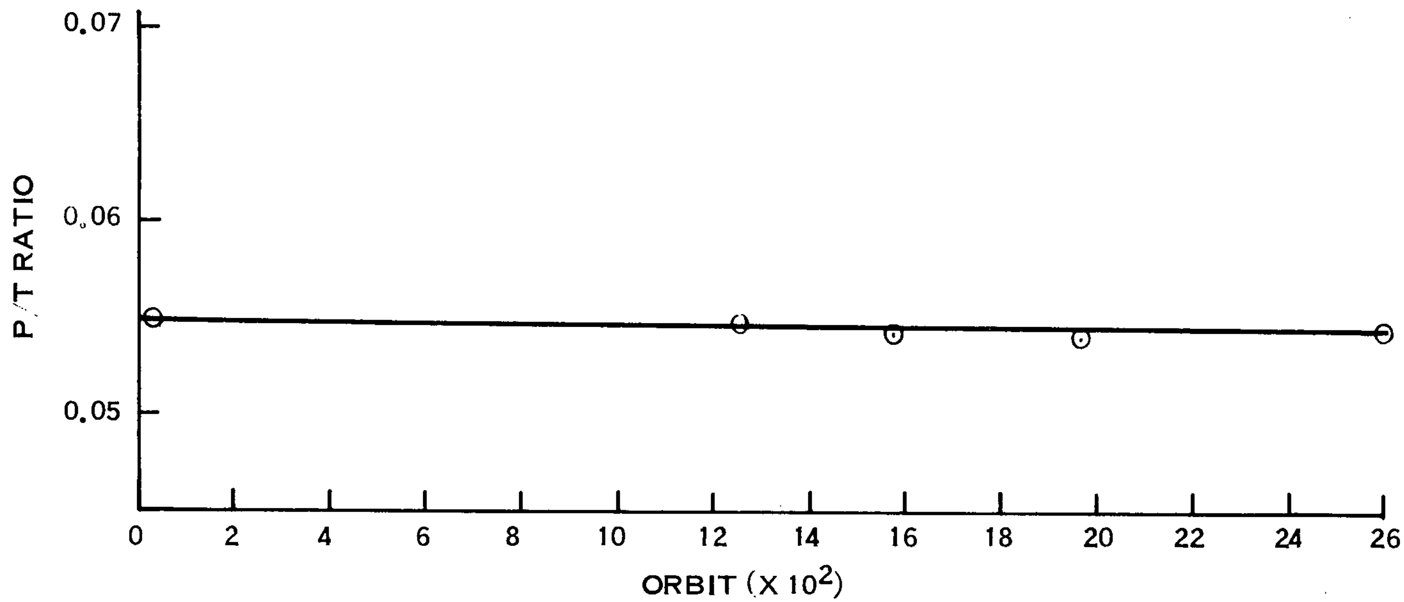


Figure 9-6. USB Pressure/Temperature Ratio

SECTION 10

ELECTRICAL INTERFACE SUBSYSTEM

Auxiliary Processing Unit (APU) consists of Search Track Data, Time Code Data, and Back-up Timers which operated satisfactorily throughout this report period. Telemetry for the APU is shown in Table 10-1. The APU is in Normal mode.

Table 10-1. APU Telemetry Functions

Functions	Description	Unit	Orbit 7	Orbit 500	Orbit 899	Orbit 1291	Orbit 1799	Orbit 2201	Orbit 2600
13200	APU, -24.5 VDC	VDC	24.90	24.91	24.91	24.91	24.91	24.91	24.90
13201	APU, -12 volts	VDC	12.08	12.08	12.08	12.08	12.08	12.08	12.08
13202	APU Temp.	DGC	25.49	26.30	26.72	26.98	27.72	27.68	28.50

The Power Switching Module (PSM) contains the switching relays for power to Orbit Adjust, MSS, WBVTR No. 1 and No. 2, RBV and PRM. The Orbit Adjust power circuit was powered for the duration of the Orbit Adjust maneuver in orbit 2416. The MSS and WBVTR No. 1 power circuits have been operated on a regular basis throughout this report period. The power relay for the RBV remained in a closed condition since orbit 196, but the RBV remained off by relays in the individual cameras and camera electronics. The WBVTR No. 2 remained off due to the failure occurring in orbit 148. Appendix B contains the anomaly bench simulator test reports.

The Interface Switching Module (ISM) performed all switching normally during this report period. Orbit Adjust Heater on and off, and Compensation Loads changes were exercised in this report period.

SECTION 11

THERMAL CONTROL SUBSYSTEM

The thermal subsystem has maintained spacecraft temperature control over a satisfactory range during this report period. Table 11-1 shows average analog telemetry values from data recorded on the NBTR. During this report period, the sun intensity reached a maximum which was +6.5% above the sun intensity at launch or +3.3% increase above the end of the last report period. This caused a gradual rise in average temperatures of about 0.5° to $2^{\circ}C$ around the spacecraft as seen in Figure 11-1.

On orbit 1409 compensation load #7 was turned off leaving compensation loads 1, 2, 4, 5 and 8 on to use excess array power and to help balance temperatures around the sensory ring. Load #7 provided heating to the Wide Band Recorder Electronics #2 and is no longer required. Compensation load history is shown in Table 11-2.

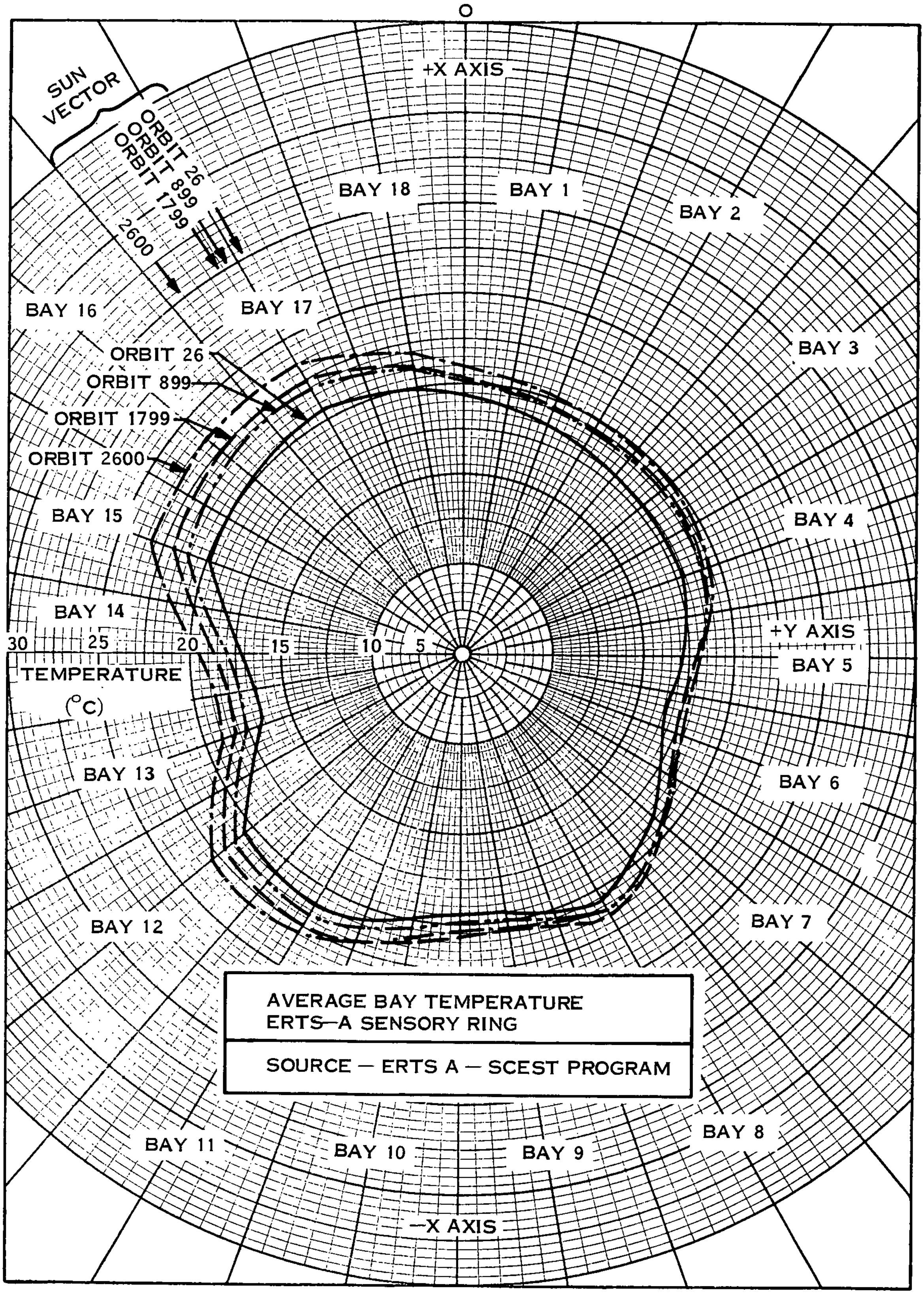


Figure 11-1. Thermal Profile Orbits 26, 899, 1799, 2600

Table 11-1. Thermal Subsystem Analog Telemetry (Average Value for Frames of Data Received in NBTR Playback)

Function	Description	Unit	7	26	500	899	1291	1799	2201	2600
7001	THM TH01 STI	DGC	19.31	19.52	20.91	21.59	21.47	20.93	21.77	22.18
7002	THM TH02 SBO	DGC	18.48	18.60	19.28	20.24	20.01	19.70	20.37	20.55
7003	THM TH03 STI	DGC	18.24	18.48	19.59	21.23	20.28	20.29	20.65	21.79
7004	THM TH03 SBI	DGC	19.24	19.47	19.85	20.12	20.46	21.11	20.53	21.11
7005	THM TH04 STI	DGC	18.25	18.39	19.18	20.73	19.81	20.08	20.07	21.17
7006	THM TH05 SBO	DGC	17.69	17.57	18.04	18.83	18.53	18.45	18.51	19.04
7007	OA -X THRUSTER	DGC	21.73	21.95	22.30	22.54	23.04	23.36	22.42	22.38
7008	THM TH07-STO	DGC	15.89	15.95	16.44	17.01	16.87	16.82	16.74	17.09
7009	THM TH06 SBI	DGC	19.41	19.38	20.07	20.73	20.62	20.62	20.61	21.05
7010	THM TH07 STI	DGC	18.36	18.61	19.17	19.61	19.71	19.79	19.68	19.79
7011	THM TH08 STO	DGC	21.60	21.78	22.22	22.52	22.87	23.24	22.38	22.52
7012	THM TH09 SBI	DGC	21.62	21.81	22.37	22.62	23.07	23.38	23.04	23.10
7013	THM TH10 SBO	DGC	18.76	18.73	19.19	19.37	19.82	20.37	19.37	19.87
7014	THM TH11 STI	DGC	22.09	22.37	23.02	23.32	23.62	24.18	24.01	24.52
7015	THM TH12 SBO	DGC	22.03	22.37	22.74	23.27	23.37	24.46	23.68	25.36
7016	THM TH13 STI	DGC	20.75	20.95	21.80	22.22	22.68	23.12	23.21	24.55
7017	RBV BEAM CTR LN	DGC	21.25	21.53	22.19	22.47	22.85	23.23	23.17	23.30
7018	THM TH14 STO	DGC	20.52	20.38	21.56	21.85	22.10	22.57	23.35	24.77
7019	NBR RAD OUTBD B4	DGC	4.88	5.09	5.51	5.96	6.08	6.23	6.03	6.06
7020	THM TH15 SBI	DGC	21.39	21.14	22.87	23.33	23.78	24.23	25.02	26.21
7021	THM TH16 STI	DGC	20.87	20.73	22.65	23.23	23.68	23.83	24.54	25.44
7022	THM TH17 SBI	DGC	20.70	20.22	22.39	23.06	23.46	23.38	24.31	25.18
7023	THM TH18 SBO	DGC	22.39	21.90	23.87	24.40	24.86	24.16	25.98	25.79
7030	THM TH03 BUR	DGC	16.01	16.05	16.50	17.82	17.09	17.11	17.17	17.89
7031	THM TH06 BUR	DGC	13.54	13.59	13.98	14.42	14.39	14.32	14.16	14.49
7032	THM TH09 BUR	DGC	19.77	19.92	20.26	20.44	20.89	21.29	20.48	20.61
7033	THM TH12 BUR	DGC	21.25	21.51	21.94	22.42	22.49	23.68	22.62	24.59
7034	THM TH15 BUR	DGC	19.92	19.70	21.40	21.85	22.44	22.09	24.17	24.36
7035	THM TH18 BUR	DGC	19.95	20.11	21.46	21.91	22.12	20.95	23.15	22.45
7040	THM TH01 TCB	DGC	18.97	19.27	20.16	20.93	20.80	20.39	21.34	21.58
7041	THM TH02 TCB	DGC	17.93	17.99	18.80	19.76	19.34	19.16	19.51	20.00
7042	THM TH03 TCB	DGC	18.22	18.34	19.00	21.32	19.72	20.28	20.00	21.83
7043	THM TH04 TCB	DGC	19.03	18.95	19.42	20.46	19.93	20.07	20.01	20.71
7044	THM TH05 TCB	DGC	16.38	16.27	16.79	17.33	17.13	17.08	17.11	17.45
7045	THM TH07 TCB	DGC	18.23	18.41	18.89	19.23	19.37	19.46	19.28	19.36
7046	THM TH09 TCB	DGC	19.64	19.38	20.04	20.15	20.60	20.86	20.39	20.52
7048	THM TH11 TCB	DGC	21.77	21.98	22.51	22.85	23.16	23.93	23.42	24.32
7049	THM TH12 TCB	DGC	21.60	21.92	22.15	22.69	22.58	23.61	23.19	25.10
7050	THM TH13 TCB	DGC	21.10	21.21	22.00	22.35	22.51	23.38	23.44	25.22
7051	THM TH14 TCB	DGC	21.94	21.38	23.02	23.23	23.65	24.18	24.77	26.19
7052	THM TH16 TCB	DGC	21.71	21.30	23.59	24.53	25.11	25.01	25.80	26.65
7053	THM TH17 TCB	DGC	22.43	21.73	23.91	24.28	24.81	24.39	25.48	25.74
7054	THM TH18 TCB	DGC	20.54	20.02	21.83	22.22	22.51	22.06	22.91	22.99
7060	THM SHUTTER BY 1	DEG	23.56	25.85	31.62	37.08	36.21	34.83	39.66	43.64
7061	THM SHUTTER BY 2	DEG	0.00	6.62	12.69	13.07	16.89	18.28	13.91	13.88
7062	THM SHUTTER BY 3	DEG	6.09	10.96	18.70	33.53	25.96	25.91	24.39	38.14
7063	THM SHUTTER BY 4	DEG	26.32	30.60	33.35	38.24	36.27	36.10	37.09	38.29
7064	THM SHUTTER BY 5	DEG	15.00	15.03	10.46	12.26	14.42	16.88	16.87	16.24
7065	THM SHUTTER BY 7	DEG	10.66	17.14	17.30	18.21	20.98	22.43	22.44	21.92
7067	THM SHUTTER BY 9	DEG	33.31	33.26	34.40	37.97	39.15	39.26	38.84	38.45
7068	THM SHUTTER BY 10	DEG	19.76	24.68	26.03	27.32	29.54	31.63	32.08	33.65
7069	THM SHUTTER BY 11	DEG	38.13	39.66	44.55	46.04	48.48	51.47	52.98	55.79
7070	THM SHUTTER BY 12	DEG	43.46	43.81	44.91	47.64	47.05	50.71	50.68	55.84
7071	THM SHUTTER BY 13	DEG	39.75	40.39	47.54	47.88	47.96	48.75	49.99	59.02
7072	THM SHUTTER BY 14	DEG	35.29	34.20	38.50	41.42	42.85	47.50	51.14	62.55
7073	THM SHUTTER BY 15	DEG	47.45	45.40	55.67	59.35	63.42	65.59	70.71	75.54
7074	THM SHUTTER BY 16	DEG	31.69	24.50	39.62	47.22	51.25	53.07	55.30	59.81
7075	THM SHUTTER BY 17	DEG	43.96	39.06	54.02	56.48	60.34	59.02	63.72	66.93
7076	THM SHUTTER BY 18	DEG	33.88	29.70	39.90	41.98	43.14	42.93	45.56	48.57
7080	THM Q1 T ZENER V	VDC	8.19	8.19	8.19	8.19	8.19	8.19	8.19	8.19
7081	THM Q2 T ZENER V	VDC	8.40	8.40	8.40	8.40	8.40	8.40	8.40	8.40
7082	THM Q3 T ZENER V	VDC	8.31	8.31	8.31	8.32	8.32	8.32	8.32	8.32
7083	THM Q1 S ZENER V	VDC	8.31	8.31	8.33	8.35	8.35	8.33	8.35	8.35
7084	THM Q2 S ZENER V	VDC	8.19	8.19	8.19	8.20	8.20	8.20	8.20	8.21
7085	THM Q3 S ZENER V	VDC	8.15	8.15	8.15	8.15	8.15	8.15	8.15	8.16
7090	THM PSM MOUNT	DGC	20.82	21.60	22.25	22.84	23.14	23.45	23.64	23.78
7091	THM IND ATTITUDE	DGC	19.15	19.40	20.05	20.71	20.69	20.86	20.87	21.07
7092	THM RBV RADIATOR	DGC	15.33	15.65	16.42	16.78	17.31	17.99	17.46	17.89
~~7093~~	~~THM RBVC CTR BM~~	~~DGC~~	~~19.84~~	~~20.30~~	~~21.06~~	~~21.36~~	~~21.81~~	~~22.29~~	~~22.35~~	~~22.49~~
7094	THM WBVTR ROOT	DGC	12.85	12.96	14.44	15.51	15.64	15.50	16.85	17.10
7095	THM WBVTR RAD CT	DGC	4.82	4.81	6.14	7.08	7.50	6.98	9.31	8.66
7096	THM WBVTR STRAP	DGC	16.46	16.62	18.18	19.54	19.39	19.12	20.45	21.06
7097	THM WB MT BAY 1	DGC	19.41	20.56	22.69	22.90	21.59	19.42	21.30	22.36
7098	THM WB MAT BAY 1	DGC	19.21	20.22	22.30	22.42	21.93	19.21	20.59	21.05
7099	THM WBVTR SEP 3	DGC	18.40	18.60	19.88	21.53	20.69	20.58	21.18	22.32
7100	THM WBVTR SEP 17	DGC	21.43	21.31	23.35	24.38	24.41	24.15	25.12	26.15
7101	THM WBVTR 1 DENT	DGC	21.26	21.49	23.16	24.67	24.19	23.75	24.85	25.95
7102	THM WBVTR 2 BAY	DGC	17.35	17.46	18.34	19.51	19.07	19.24	19.45	20.04
7103	THM WBVTR 2 BY 15	DGC	21.08	21.00	22.80	23.43	23.75	24.05	24.71	25.65
7104	THM WBVTR 2 CTR	DGC	19.05	19.35	20.88	21.94	21.86	21.97	22.73	23.50
7105	THM NBTR B SEP 6	DGC	17.90	18.06	18.85	19.69	19.71	19.87	20.10	20.17
7106	THM NBTR B SEP 1	DGC	20.75	20.82	22.16	22.59	22.89	23.43	23.86	24.88
7107	THM NBTR BM CTR	DGC	18.95	19.37	20.48	21.12	21.34	21.72	22.06	22.44
7108	THM MSS MOUNT 14	DGC	19.21	19.18	20.77	21.26	21.59	22.27	22.75	23.89
7109	THM OA -Y THRUSTER	DGC	22.27	22.21	24.00	24.43	24.85	25.53	26.63	28.11
7110	THM MSS WBVTR BM	DGC	17.94	18.14	19.30	20.17	20.27	20.60	21.05	21.29
7111	THM OA +X THRUSTER	DGC	19.44	20.30	22.03	22.24	21.82	19.98	21.58	23.43
7130	THM AVX P1 T	DGC	18.69	15.69	16.99	7.94	14.42	19.92	19.57	11.23
7131	THM AVX P2 T	DGC	6.81	10.63	2.56	1.15	19.10	15.66	1.20	3.63

FOLDOUT FRAME 1

FOLDOUT FRAME 2

Table 11-2. Compensation Load History

ORBITS	COMPENSATION LOADS 1	2	3	4	5	6	7	8
Launch	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0
2	0	0	X	X	X	0	X	X
5	0	0	X	X	X	0	X	X
6	X	X	X	X	X	0	X	X
117	X	X	X	X	X	0	X	X
118	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0
156	X	X	X	X	X	0	X	X
193	X	X	X	X	X	0	X	X
194	0	0	0	0	0	0	0	0
196	0	0	0	0	0	0	0	0
197	X	X	X	X	X	0	X	X
700	X	X	X	X	X	0	X	X
701	X	X	0	X	X	0	X	X
1409	X	X	0	X	X	0	X	X
1410	X	X	0	X	X	0	0	X
2600	X	X	0	X	X	0	0	X

SECTION 12

NARROWBAND TAPE RECORDERS

The Narrowband Tape Recorder Subsystem continued to operate in a completely satisfactory manner. Since Orbit 1, the two Recorders A and B have alternated in Record and Playback Modes with a nominal one minute overlap.

Table 12-1 lists the telemetry values for Thermo-Vacuum Testing, for the initial orbits and for late orbits. The values vary slightly from orbit to orbit, but are substantially unchanged. The specific differences are shown for Orbit 1950 in Table 12-2. These are typical variations, that rise and subside, and show no trend.

Since launch, each recorder has had an on time of 2281 hours. Each recorder was in the Playback mode for 95 hours and 48 minutes, in the Record mode for 2185 hours and 12 minutes, and in the OFF mode for 2281 hours.

Table 12-3 is a 5% random sample (5 orbits from each week) showing the performance of the NBTR Subsystem in its entirety, including the radio downlink and the ground station processing. At the end of the table, there is a listing of values from early orbits for comparison.

The first two columns show the percentage of bad data and missing data at the end of processing. As can be seen, both are usually zero. Higher values are attributed to noise on the radio downlink.

The third column shows the data rate, nominally 24 kilobits, reflecting the speed of the motor during playback. The true value varies from 23.83 to 23.87 averaging 23.85 showing that the playback motor speed is slightly less than planned. This has no effect on the fidelity of the playback, but only increases the playback time by less than 1%.

The last column shows the extent of the "wow" and "flutter" effects in a major frame. It is characteristically 2 or 3 hundredths of 1%, a completely satisfactory value. The occasional high values are attributed to noise effects.

Since the complete subsystem shows satisfactory performance, each of its component parts are therefore satisfactory, including the Narrowband Tape Recorders.

In Table 12-3 it will be noticed that for those orbits with a high percentage of bad or missing data, or high standard deviation of the data rate, the A recorder was in use for 72% of the orbits. This is not considered significant however, due to the sampling technique and the fact that the B recorder was also significantly involved--in fact, the highest percent missing data, and the highest deviation of the data rate was with the B recorder. Although the study is continuing, it is concluded from present data that the abnormalities are due to noise, and not recorder malfunction.

Table 12-1. Narrowband Tape Recorder Telemetry Values

Function		Typical Telemetry Values			
		Thermal Vac Values	Orbital Values		
Number	Name		6	1959	1951
10001	A - Motor Cur. (ma)				
	Record	198	190.10	189.47	189.47
	P/B	185	180.00	177.63	-
10101	B - Motor Cur. (ma)				
	Record	194	193.26	192.79	192.63
	P/B	185	188.18	-	189.47
10002	A - Pwr Sup. Cur. (ma)				
	Record	315	320.56	339.81	339.81
	P/B	540	535.78	563.11	-
10102	B - Pwr Sup. Cur. (ma)				
	Record	313	317.62	333.75	333.75
	P/B	535	570.78	-	567.50
10003	A - Rec. Temp. (DGC)	25.4	25.47	26.25	26.25
10103	B - Rec. Temp. (DGC)	23.8	24.58	25.38	25.38
10004	A - Supply (VDC)	-24.55	-24.47	-24.50	-24.50
10104	B - Supply (VDC)	-24.49	-24.44	-24.57	-24.57

Table 12-2. Narrowband Tape Recorder Telemetry Changes

	Orbit 1950			
	Record % Change from		Playback % Change from	
	Thermal Vac	Early Orbit	Thermo Vac	Early Orbit
10001 A Motor Cur.	-4.3	-0.3	-4.0	-1.3
10101 B Motor Cur.	-0.7	-0.3	+2.3	+0.7
10002 A Pwr Sup Cur.	+7.9	+6.0	+4.3	+5.1
10102 B Pwr Sup Cur.	+6.6	+5.1	+6.1	-0.6

Table 12-3. Narrowband Recorder Subsystem Performance

	% DATA		DATA RATE		
ORBIT	BAD	MISSING	MEAN	STD. DEV.	NBTR*
1320	0.01	0.00	-23.85	0.03	
1337	0.00	0.00	-23.85	0.03	
1356	0.00	0.00	-23.85	0.03	
1375	0.50	0.00	-23.83	0.86	A
1394	0.00	0.00	-23.82	0.02	
1407	0.00	0.00	-23.84	0.03	
1439	0.25	0.78	-23.85	0.98	B
1459	0.01	0.00	-23.83	0.02	
1473	0.00	0.00	-23.83	0.02	
1495	0.00	0.00	-23.83	0.02	
1506	0.00	0.22	-23.85	0.03	A
1518	0.00	0.13	-23.87	0.03	
1536	0.00	0.00	-23.85	0.03	
1557	0.00	0.00	-23.83	0.13	
1588	0.00	0.26	-23.87	0.03	A
1616	0.00	0.13	-23.87	0.03	
1640	0.00	0.00	-23.84	0.03	
1650	0.08	0.00	-23.83	2.80	B
1678	0.00	0.00	-23.84	0.02	
1691	0.00	0.00	-23.84	0.03	
1706	0.10	0.00	-23.86	0.68	A
1724	0.00	0.00	-23.84	0.03	
1732	0.00	0.13	-23.87	0.03	
1765	0.00	0.00	-23.83	0.02	
1790	0.01	0.00	-23.84	0.03	
1813	0.00	0.00	-23.84	0.02	
1820	0.00	0.00	-23.84	0.03	
1840	0.00	0.00	-23.85	0.03	
1873	0.00	0.30	-23.83	0.02	B
1897	0.31	0.00	-23.84	0.03	A
1926	0.24	0.00	-23.86	0.67	A
1941	0.00	0.00	-23.85	0.41	A
1960	0.00	0.00	-23.85	0.03	
1980	0.16	0.00	-23.84	0.93	B
1999	0.00	0.00	-23.84	0.03	
2013	0.00	0.54	-23.84	0.03	A
2041	0.01	0.00	-23.85	0.03	
2065	0.01	0.00	-23.86	0.02	
2076	0.00	0.13	-23.85	0.03	
2091	0.21	0.23	-23.85	0.57	A
2113	0.00	0.52	-23.84	0.03	A
2148	0.00	0.00	-23.85	0.03	
2169	0.00	0.26	-23.83	0.02	B
2179	0.10	0.00	-23.83	0.02	A
2192	0.00	0.00	-23.85	0.02	
2221	0.01	0.00	-23.85	0.03	
2231	0.00	0.00	-23.85	0.02	
2250	0.00	0.30	-23.83	0.02	
2265	0.00	0.24	-23.85	1.16	A
2287	0.19	0.00	-23.85	0.54	A
2337	0.00	0.00	-23.85	0.03	
2351	0.00	0.00	-23.85	0.03	
2371	0.03	0.22	-23.85	0.07	A
2388	0.03	0.00	-23.85	0.03	
2396	0.01	0.24	-23.85	0.04	A
2417	0.00	0.00	-23.83	0.02	
2438	0.00	0.28	-23.85	0.03	A
2453	0.00	0.13	-23.85	0.03	
2474	0.00	0.25	-23.85	0.03	A
2496	0.00	0.25	-23.85	0.60	A
2510	0.01	0.00	-23.85	0.02	
2523	0.00	0.14	-23.85	0.03	B
2554	0.00	0.00	-23.85	0.02	
2571	0.00	0.00	-23.83	0.02	
2599	0.00	0.00	-23.85	0.02	
SAMPLE FROM EARLY ORBITS					
925	0.03	0.00	-23.85	0.03	
927	0.01	0.00	-23.85	0.03	
950	0.68	0.00	-23.86	1.01	B
951	0.00	0.00	-23.83	0.02	
953	0.00	0.00	-23.82	0.02	

*The NBTR in use is identified for only those orbits with high % of bad or missing data or high standard deviation of the data rate.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

SECTION 13

WIDEBAND TELEMETRY SUBSYSTEM

The Wideband Telemetry Subsystem has operated satisfactorily since launch, including both its Wideband Power Amplifiers (WPA No. 1 and WPA No. 2).

WPA No. 1, normally associated with RBV, was not used after orbit 196 because the RBV was off due to a failure in the power input circuit (see Section 14). Between Orbits 1891 and 2100, however, WPA No. 1 was substituted for WPA No. 2 to operate with the MSS because its frequency was less likely to cause interference with frequencies being used for the flight of Apollo 17 which occurred at that time.

WPA No. 1 has had a cumulative ON time of 31 hours 55 minutes and 9 seconds, operating nearly equally in the real-time and the playback modes.

WPA No. 2 has had a cumulative ON time of 235 hours, 54 minutes and 48 seconds, with practically equal operating times in real-time and playback modes.

Table 13-1 lists the telemetry values for the Wideband Telemetry Subsystem. All values are normal.

It is interesting to note that WPA No. 1 after being idle from orbit 196 on 6 August until orbit 1890 on 6 December (four months) came back on the air with a power output lowered by 0.3 dB. The output power, after dropping slightly, finally increased so that after 200 orbits it had regained its post launch value. WPA No. 2 has remained practically constant since it was put in the 20 watt mode in orbit 30.

Figures 13-1 and 13-2 show the ground station (Goldstone) AGC readings as a function of slant range. Superimposed on these plots are a few points from the earliest orbits, and a few from the latest orbits, in order to show there is no significant trend upward or downward with passing time, confirming the power output measurement reported by telemetry.

Table 13-1. Wideband Modulator Telemetry Values

WBPA-1 Function Number	Name		T/V* Values	Orbits 26	1849	1944	2095
12001	Temp TWT Coll.	(DgC)	38.7	35.7	39.20	39.90	39.90
12002	Helix Current	(Ma)	6.47	6.08	6.49	6.58	6.78
12003	TWT Cath. Cur.	(Ma)	45.4	45.89	43.54	43.48	45.01
12004	Forward Pwr	(DBM)	43.2	43.18	42.88	42.61	43.15
12005	Reflected Pwr	(DBM)	32.4	34.95	34.99	34.80	35.21
12227	Loop Str. AFC ConVolt	(MHZ)	(1)	-0.39	-1.26	-0.86	-0.67
12229	Mod Temp VCO	(DgC)	24.4	21.93	20.31	20.88	20.39
12232	+15VDC A(3) Pwr Sup (3)	(TMV)	2.69	2.69	2.69	2.65	2.62
12234	-15 VDC Pwr Sup A	(TMV)	5.91	5.98	5.96	5.73	5.78
12236	+5 VDC Pwr Sup A	(TMV)	4.01	3.94	3.94	3.94	3.95
12238	-5 VDC Pwr Sup A	(TMV)	5.26	5.28	5.26	5.18	5.12
12240	-24 VDC Unreg Volt A	(TMV)	5.42	5.56	5.51	5.42	5.49
12242	Inv. Temp	(DgC)	24.5	20.60	23.43	24.71	24.04

WBPA-2 Function Number	Name		T/V* Values (2)	Orbits 33	1555	2128	2595
12101	Temp TWT Coll.	(DgC)	31.5	35.38	37.11	36.54	34.80
12102	Helix Current	(Ma)	5.26	7.32	7.37	7.57	7.46
12103	TWT Cath. Cur.	(Ma)	33.5	44.30	42.50	42.65	42.52
12104	Forward Pwr	(DBM)	41.2	43.57	43.44	43.54	43.35
12105	Reflected Pwr	(DBM)	30.6	31.59	32.37	32.59	32.11
12228	Loop Str HFC ConVolt	(MHZ)	(1)	1.11	-0.30	-0.43	-1.01
12229	Mod Temp VCO	(DgC)	24.4	21.70	24.57	22.87	24.04
12232	+15 VDC A(3) Pwr Sup	(TMV)	2.67	2.68	2.68	2.69	2.58
12234	-15 VDC Pwr Sup A	(TMV)	5.95	5.90	5.88	5.91	5.71
12236	+5 VDC Pwr Sup A	(TMV)	4.01	3.97	3.97	4.02	3.91
12238	-5 VDC Pwr Sup A	(TMV)	5.26	5.24	5.25	5.25	5.05
12240	-24.5 VDC Unreg Volt A	(TMV)	5.42	5.43	5.39	5.42	5.33
12242	Inv. Temp	(DgC)	24.5	23.03	23.88	24.69	22.95

*Thermal Vacuum Test Data

(1) Satisfactory if not zero or -7.5.

(2) Tested T/V in 10-watt mode; put in 20-watt mode in Orbit 30 and used in that mode since. Thermal vacuum values not representative for orbital operation, therefore.

(3) B Power Supply not used in orbit.

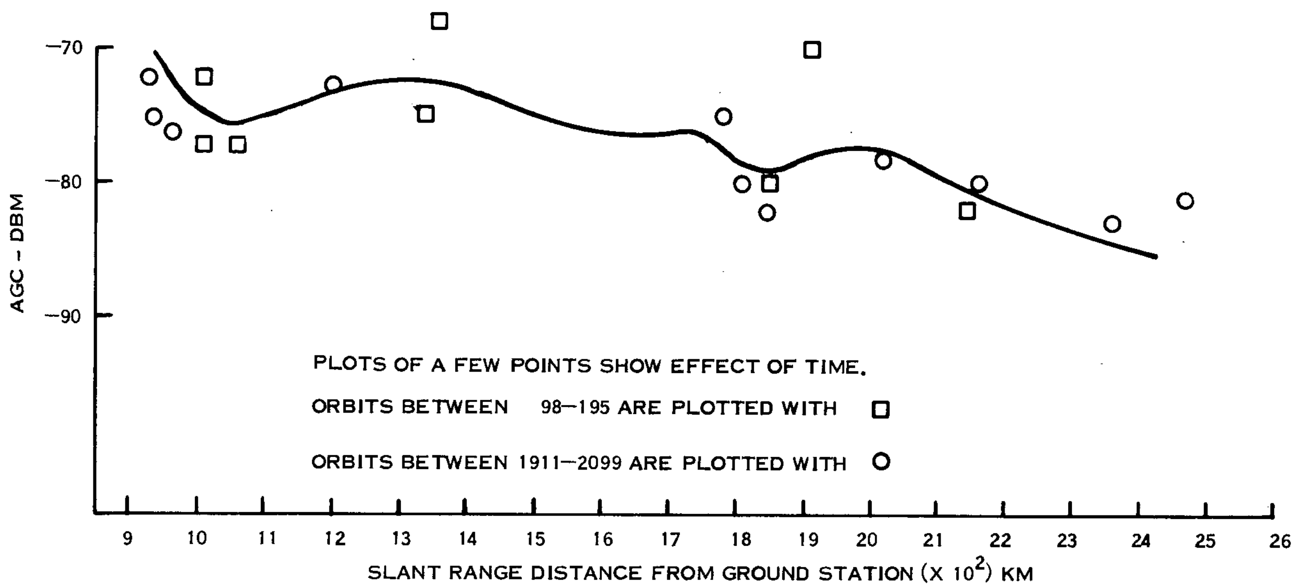


Figure 13-1. WPA-1 Ground Station AGC Readings

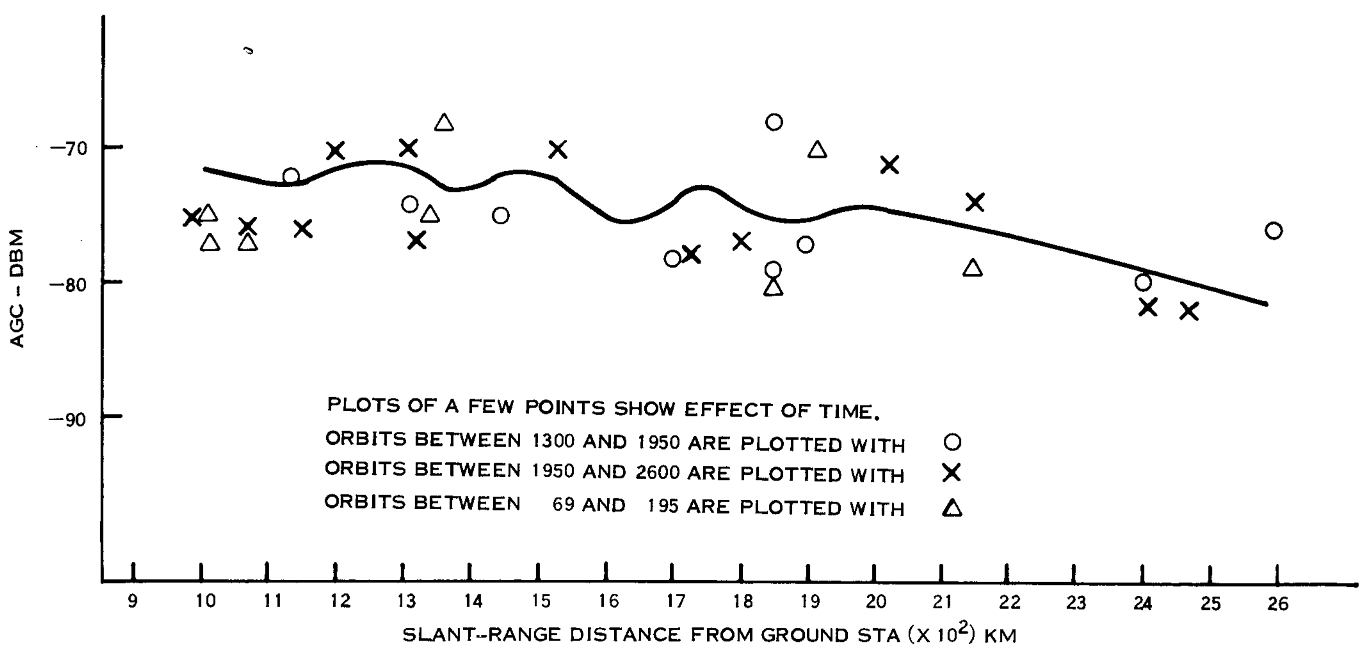


Figure 13-2. WPA-2 Ground Station AGC Readings

SECTION 14

ATTITUDE MEASUREMENT SENSOR

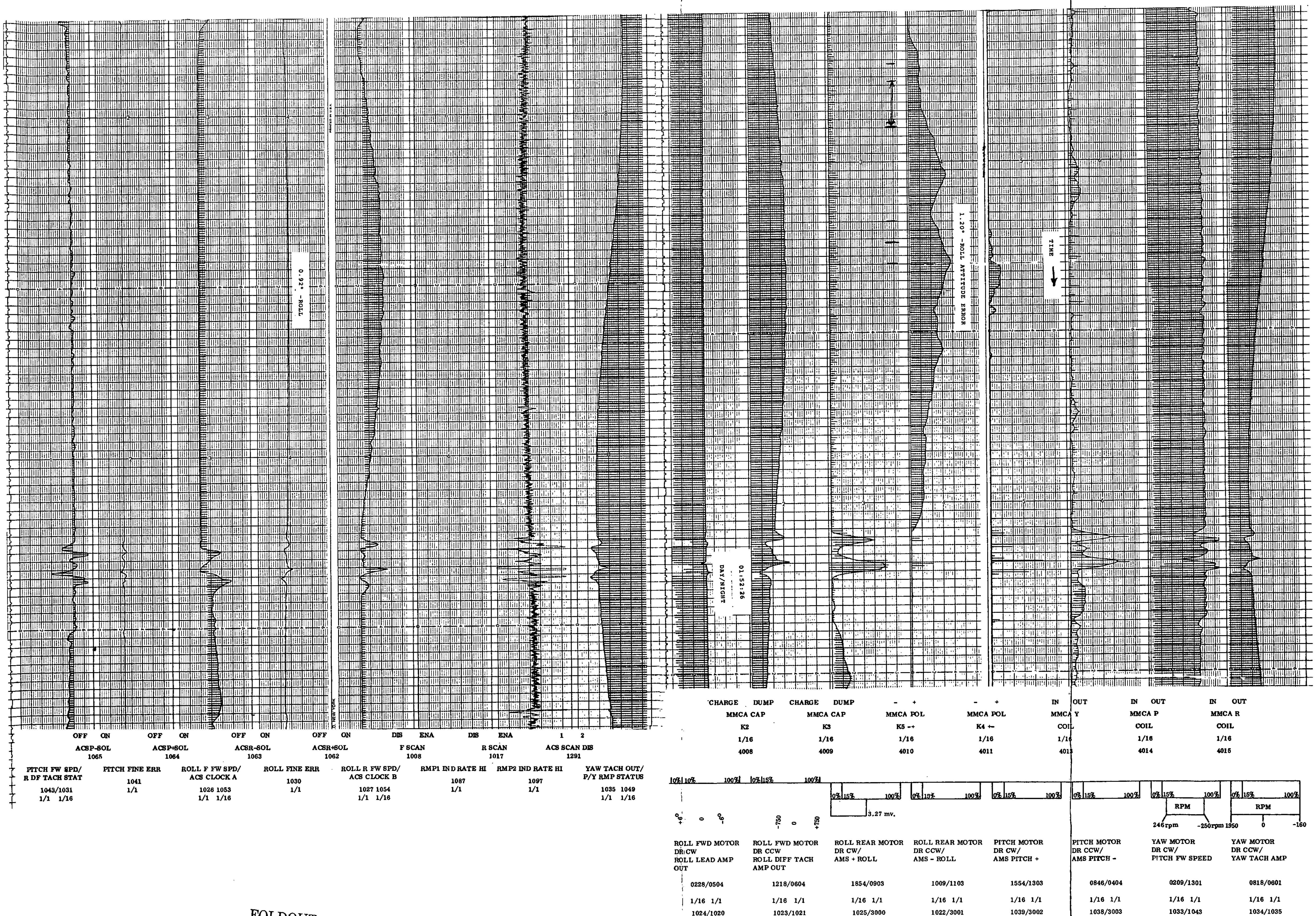
The AMS has consistently produced attitude values which seem reasonable. Since no direct precise correlation can be made with the Attitude Control System the AMS values are accepted. Effort is continuing to refine techniques to evaluate AMS performance. Occasionally the AMS error exceeds one degree in -roll during satellite day. The highest error noted was 1.2^{o} as illustrated in Figure 14-1, at this time, the ACS fine error in roll indicated 0.92^{o} -roll. This excursion beyond one degree error is caused by inhibiting the ACS gating during satellite day and permitting gates only during night. The AMS sensor is functioning properly. The wheel speed at this error was 1250 RPM. Gating, if permitted, would occur at 925 RPM.

Table 14-1 gives typical AMS telemetry values.

Table 14-1. AMS Temperature Telemetry Summary

Function No.	Name	Units	*T/V 20°C Plateau	Orbit			
				35	1799	2201	2600
3004	Case - Temp 1	°C	19.1	18.92	19.92	20.18	20.05
3005	Assembly - Temp 2	°C	18.9	19.15	20.25	20.18	20.27

*Thermal Vacuum Test Data



FOLDOUT FRAME 1

FOLDOUT FRAME 2

Figure 14-1. Attitude Measurement Sensor Performance Characteristics Type

SECTION 15

WIDEBAND VIDEO TAPE RECORDERS (WBVTR-1 AND WBVTR-2)

The Wideband Video Tape Recorder Subsystem consists of two components, WBVTR-1 and WBVTR-2.

WBVTR-2 failed in orbit 148 (see Appendix B) after nine hours, 26 minutes and 33 seconds of satisfactory performance.

WBVTR-1 has operated satisfactorily since being put into operational use in Orbit 26, for a cumulative ON time of 392 hours, 20 minutes and 56 seconds. Of this time, the video head was in contact with the moving tape for 310 hours. During the pre-launch testing, there were 126 hours of such contact as of 23 July 1972. (Launch was 23 July 1972.) It is estimated that 500 hours--the specified minimum performance time--of such contact will be reached about Orbit 3200 in early March 1973.

Table 15-1 lists typical telemetry values for WBVTR-1 for the orbits of this report period. All values are normal. The values for WBVTR-2 were also included for completeness and convenience.

Table 15-2 shows the telemetry values for the indicated functions for each operational mode in Orbit 2379, which included Standby, Record, Rewind and Playback.

As a measure of the fidelity of the Wideband Video Tape Recorder, the minor frame sync error (MFSE) count experienced by the Multispectral Scanner Subsystem (MSS) was observed. During real-time transmissions of MSS data, the MFSE count is invariably zero; during playback of MSS data recorded on the WBVTR the MFSE count can then be used to measure the degradation contributed by the WBVTR. Counts during 10-second intervals are made. Figure 15-1 shows a plot of typical values of these 10-second count averages. There is no discernible trend upward or downward in the MFSE count.

Table 15-1. WBVTR Telemetry Values

WBVTR-1 Functions				Telemetry Values In Orbits			
Number	Name		In T/ V*	15	1347	2073	2599
13022	Pressure Trans	(PSI)	16.3	16.12	16.43	16.46	16.38
13023	Temp Trans	(DgC)	22.0	19.50	25.53	26.55	25.05
13024	Temp Elec	(DgC)	28.7	22.78	29.44	30.39	25.34
13026	Capstan Speed	(%)	98.0	100.51	96.63	95.44	98.25
13027	Headwheel Speed	(%)	99.6	95.16	97.99	97.97	96.84
13028	Capstan Mot I	(Amp)	0.24	0.25	0.27	0.24	0.26
13029	Input P/ B Volt.	(VVP)	② 0.76	0.72	0.44	0.44	0.41
13030	Headwheel Mot I	(Amp)	0.55	0.55	0.53	0.53	0.55
13031	Rec Input I	(Amp)	3.55	3.15	3.53	3.50	3.31
13032	Lim Volt Out	(VPP)	1.48	1.44	1.45	1.47	1.42
13033	Servo Volt	(%)	50.0	50.03	50.07	50.38	50.23
13034	+5.6 VDC Conv	(VDC)	5.66	5.66	5.72	5.66	5.71
13200	-24.5 VDC	(VDC)	①	-24.91	-24.91	-24.90	-24.90
13201	-12 VDC	(VDC)	①	-12.08	-12.08	-12.08	-12.08
13202	Temp APU	(DgC)	①	25.79	27.12	27.95	28.24
WBVTR-2 Functions							
Number	Name		In T/ V *	Orbit Number 15	64	103	147
13122	Pressure, Trans	(PSI)	③	15.99	16.25	16.25	16.11
13123	Temp Trans	(DgC)		18.46	19.19	20.72	21.09
13124	Temp Elec	(DgC)		21.50	22.00	24.00	21.92
13126	Capstan Speed	(%)		99.91	100.53	100.80	99.38
13127	Headwheel Speed	(%)		94.16	95.48	97.64	98.78
13128	Capstan Mot I	(Amp)		0.17	0.24	0.24	0.28
13129	Input P/ B Volt.	(VPP)		0.66	0.63	0.62	0.61
13130	Headwheel Mot I	(Amp)		0.55	0.59	0.52	0.53
13131	Rec Input I	(Amp)		3.70	3.53	3.07	3.43
13132	Lim Volt. Out	(VPP)		1.34	1.41	1.41	1.39
13133	Servo Volt	(%)		49.47	49.60	49.80	49.48
13134	+5.6 VDC	(VDC)		5.47	5.64	5.58	5.59
13200	-24.5 VDC	(VDC)		-24.91	-24.90	-24.90	-24.90
13201	-12 VDC	(VDC)		-12.08	-12.08	-12.08	-12.09
13202	Temp APU	(DgC)		25.79	26.31	27.64	26.19

*Thermal Vacuum Test Data

① Thermal VacValues not given

② After Orbit 196 WBVTR-1 configured to MSS: Thermo Vac Value then 0.40.

③ Thermal Vacuum Data are not available for WBVTR-2.

Table 15-2. Function Values by Mode in Orbit 2379

Function	Playback		Standby		Rewind		Record	
	T/V	2379	T/V	2379	T/V	2379	T/V	2379
13034	5.66	5.44	5.86	5.89	5.86	5.89	5.63	5.71
13029	0.37	0.45	0	0	0	0	0	0
13028	0.25	0.25	0	0	0.18	0.20	0.28	0.24
13030	0.56	0.55	0.45	0.44	0.50	0.44	0.55	0.55
13031	3.27	3.89	2.04	2.08	2.16	2.18	3.55	3.63
13022	16.3	16.4	16.3	16.4	16.3	16.4	16.3	16.4
13032	1.48	1.48	0	0	0	0	0	0
13033	50.0	50.37	0	0	0	0	0	0
13026	98.0	97.2	0	0	102.20	101.1	99.60	96.7
13027	99.7	97.8	103.10	102.8	101.90	100.7	99.60	100.1
13023	22.0	25.5	22.0	26.0	22.0	26.0	22.0	27.5
13024	28.7	28.5	28.7	29.5	28.7	29.0	28.7	31.6

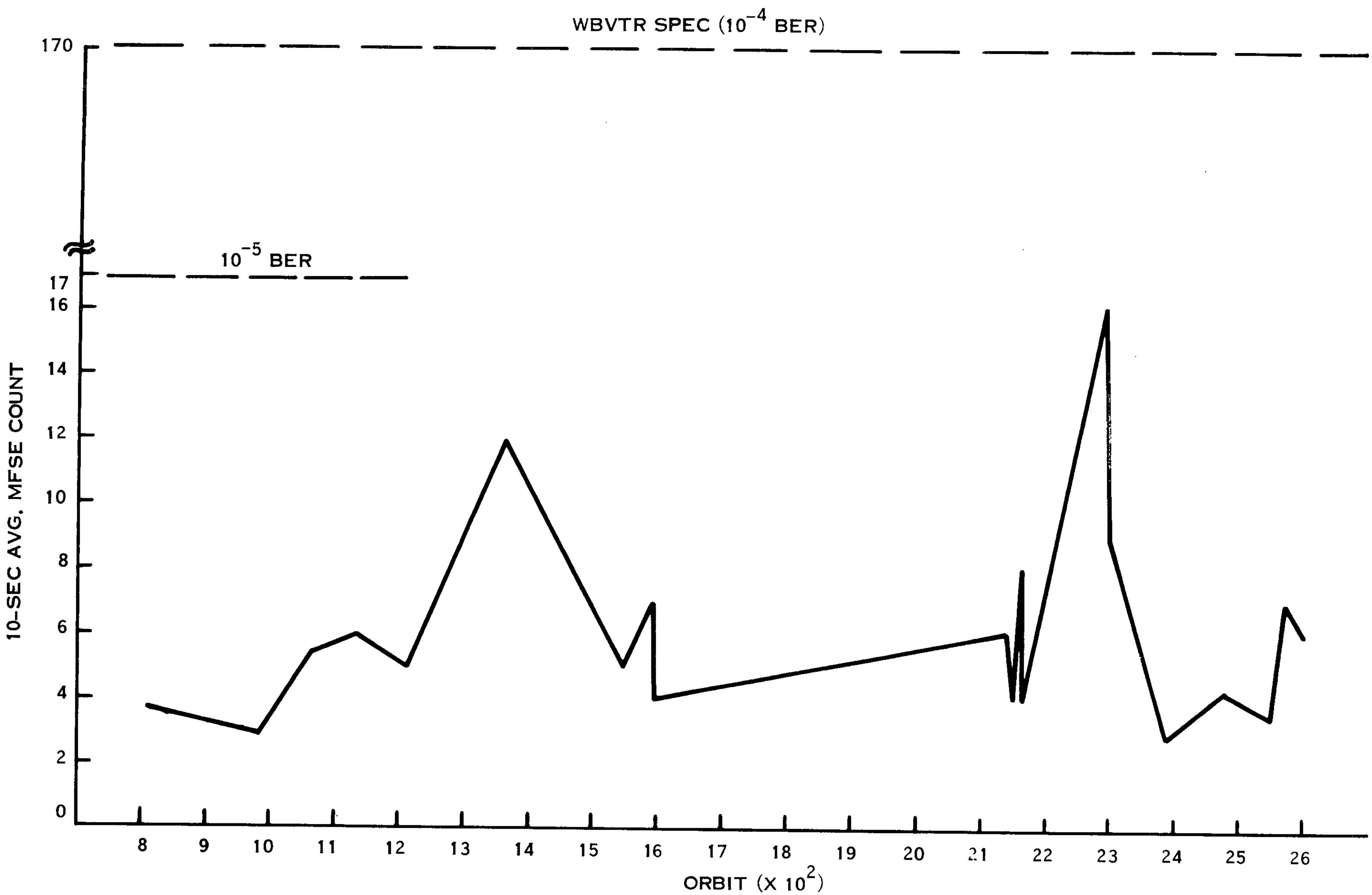


Figure 15-1. Typical Average Values of MSS Minor Frame Sync Error (MFSE) Counts Over 10-Sec Intervals for WBVTR-1 Playback

SECTION 16

RETURN BEAM VIDICON

The Return Beam Vidicon (RBV) Subsystem operated normally from turn-on in Orbit 19 to Orbit 196 when it failed to respond to an off command. The RBV itself was not the cause of the failure, nor was it affected by the failure. The complete bench test report of this study is given in Appendix B. The RBV has not been reactivated since Orbit 196.

An assessment of the RBV performance was given in ERTS-1 Flight Evaluation Report 23 July to 23 October, 1972. For completeness and convenience, the telemetry values are repeated in Table 16-1.

Table 16-1. RBV Telemetry Values

FUNCTION NO.	NAME	T/V VALUE	ORBITS 26	85	149	196
14001	CCC Board Temp. (DgC)	(1)	18.61	20.04	19.30	19.53
14002	CCC Pwr. Sup. Temp (DgC)	(1)	19.93	21.58	20.70	21.21
14003	±15 VDC Sup. (TMV)	3.95	3.69	3.95	3.78	3.95
14004	∓6V-5.25 VDC Sup. (TMV)	3.05	2.84	2.93	2.98	3.05
14100	VID OUT CAM 1 (TMV)	1.06	1.04	1.15	1.13	1.12
14200	VID OUT CAM 2 (TMV)	1.09	1.05	1.26	1.23	1.24
14300	VID OUT CAM 3 (TMV)	1.05	1.03	1.21	1.19	1.20
14102	Comb. Align I Com 1 (TMV)	3.95	3.67	3.94	3.87	3.94
14202	Comb. Align I Com 2 (TMV)	3.92	3.90	3.91	3.89	3.91
14302	Comb. Align I Com 3 (TMV)	4.04	3.75	4.03	3.80	4.03
14103	Cam 1 Elec Temp. (DgC)	(1)	20.84	23.37	22.64	25.38
14203	Cam 2 Elec Temp. (DgC)	(1)	18.64	21.06	20.62	22.87
14303	Cam 3 Elec Temp. (DgC)	(1)	21.05	23.61	23.23	25.57
14104	Cam 1 LV Pwr Sup T. (DgC)	(1)	21.71	23.94	23.49	25.92
14204	Cam 2 LV Pwr Sup T. (DgC)	(1)	18.38	20.63	19.40	23.30
14304	Cam 3 LV Pwr Sup T. (DgC)	(1)	20.75	23.02	22.73	25.67
14105	Cam 1 Def. + 10 VDC (TMV)	4.01	3.73	4.00	3.77	4.00
14205	Cam 2 Def. + 10 VDC (TMV)	4.00	3.71	3.98	3.77	3.98
14305	Cam 3 Def. + 10 VDC (TMV)	3.97	3.95	3.95	4.02	3.95
14106	Cam 1 + 6V -6.3 VDC (TMV)	3.71	3.45	3.70	3.61	3.70
14206	Cam 2 + 6V -6.3 VDC (TMV)	3.69	3.42	3.67	3.49	3.67
14306	Cam 3 +6V -6.3 VDC (TMV)	3.73	3.47	3.72	3.47	3.72
14107	Cam 1 Telec I (TMV)	2.62	2.50	2.54	2.55	2.64
14207	Cam 2 Telec I (TMV)	2.65	2.53	2.56	2.41	2.64
14307	Cam 3 Telec I (TMV)	2.64	2.54	2.51	2.45	2.61
14108	Cam 1 Vid Fil I (TMV)	2.47	2.30	2.36	2.38	2.46
14208	Cam 2 Vid Fil I (TMV)	2.54	2.37	2.52	2.39	2.52
14308	Cam 3 Vid Fil I (TMV)	2.61	2.44	2.60	2.53	2.60
14110	Cam 1 TARVOLT (TMV)	3.43	3.42	3.42	3.45	3.42
14210	Cam 2 TARVOLT (TMV)	3.36	3.13	3.22	3.26	3.32
14310	Cam 3 TARVOLT (TMV)	3.47	3.23	3.46	3.45	3.47
14113	Cam 1 Vert Def V (TMV)	2.96	2.75	2.90	2.85	2.97
14213	Cam 2 Vert Def V (TMV)	3.00	2.86	2.98	2.86	3.01
14313	Cam 3 Vert Def V (TMV)	3.45	3.45	3.47	3.37	3.45
14114	Cam 1 Vid FPT (DgC)	(1)	18.15	20.77	17.91	20.99
14214	Cam 2 Vid FPT (DgC)	(1)	20.62	20.11	20.52	20.62
14314	Cam 3 Vid FPT (DgC)	(1)	18.54	20.88	19.08	20.20
14115	Cam 1 Foc Coil T (DgC)	(1)	17.71	21.67	18.74	19.70
14215	Cam 2 Foc Coil T (DgC)	(1)	17.70	21.60	19.25	19.97
14315	Cam 3 Foc Coil T (DgC)	(1)	18.03	22.09	19.88	20.56

(1) Thermo-Vacuum temperatures for these functions were not reported.

SECTION 17

MULTISPECTRAL SCANNER SUBSYSTEM

The Multispectral Scanner Subsystem (MSS) continued to operate satisfactorily. Since launch the MSS has had 3073 on-off cycles, imaging 35, 331 scenes covering 307.9×10^6 square nautical miles of earth surface, amounting to over seven times the total earth land masses. The operating time was 350 hours, 21 minutes and 57 seconds, operating 44% in the real time mode and 56% in the record mode. The average number of scenes imaged per day since launch was 195 neglecting scheduled off-days in the flight activation period and in the period following Orbits 148 and 196 when studies were being made of the WBVTR-1 and RBV operational anomalies.

There has been no command anomalies associated with the MSS since launch.

Telemetry values have been normal since launch as is shown in the typical readings in Table 17-1.

Figure 17-1 shows the history of the line length variations. Past Orbit 400, the maximum-to-minimum spread is less than 3 words.

The calibration wedges, which showed a decreasing quantum level for the first 1200 orbits in bands 1 and 2, levelled off, and now show a tendency to rise. Figure 17-2 is a typical plot of this aspect.

The mux transfer function was checked by switching from compressed to linear mode in sequence during the same operating period of Orbit 2375. The sequence was reversed in a subsequent Orbit (2389). Evaluation of the resulting data shows there has been no significant changes in this transfer function.

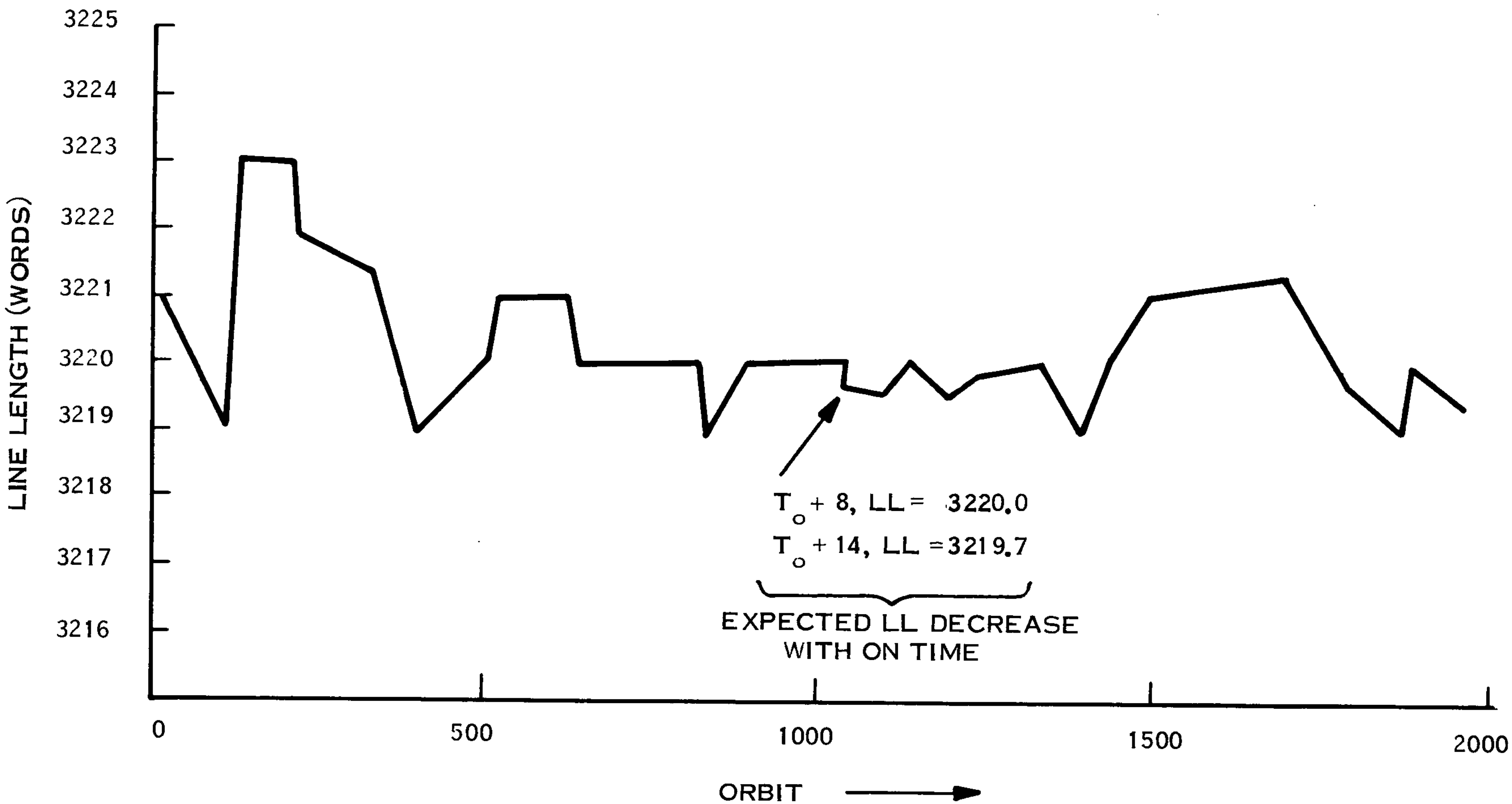


Figure 17-1. Line Length vs Orbit

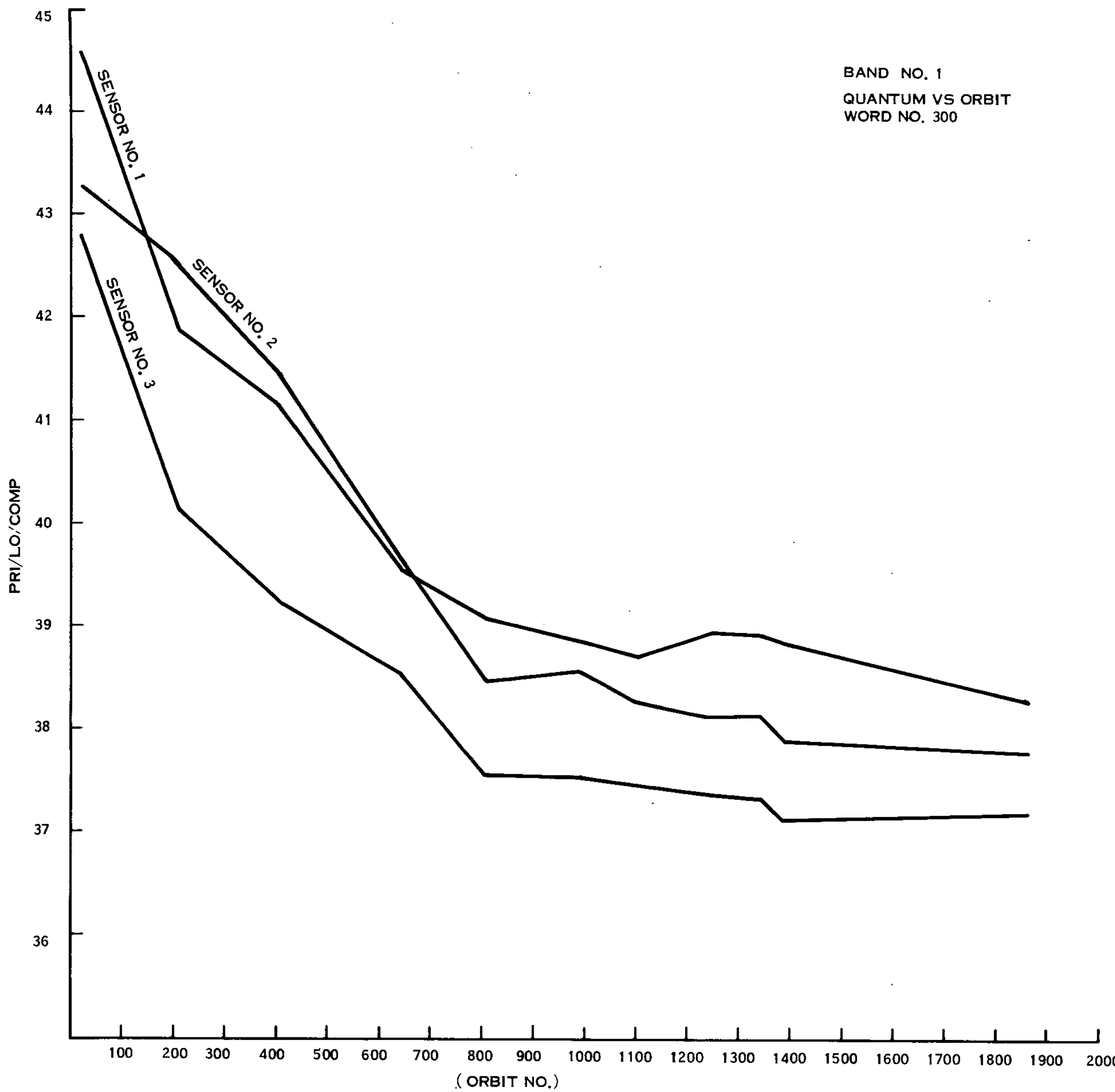


Figure 17-2. Cal Wedge Quantum vs Orbit

Table 17-1. MSS Telemetry Values

Function No.	Name	T/V Val *	20	1581	1961	2599
15044	FOPT 2 T	(DGC) 20.5	17.46	19.85	20.83	21.03
15046	ELEC CVR T	(DGC) 21.5	19.37	21.89	23.27	23.53
15048	SCAN MIR REG T	(DGC) 22.8	16.35	20.39	22.28	22.84
15050	SCAN MIR DR. COIL T	(DGC) 22.4	15.94	19.68	21.58	21.97
15052	ROT SHUT HSG T	(DGC) 20.8	16.91	19.41	20.62	20.88
15043	FOPT 1 T	(DGC) 20.6	17.67	20.02	20.98	21.17
15045	MUX PWR CASE T	(DGC) 22.4	21.19	23.62	25.72	26.84
15047	PWR SUP T	(DGC) 21.6	17.41	20.28	21.64	21.95
15049	SCAN MIR DR. ELC T	(DGC) 22.8	16.12	20.07	22.20	22.76
15051	SCAN MIR HSG T	(DGC) 21.1	15.60	19.42	21.02	21.46
15040	MUX -6 VDC	(TMV) 3.95	4.03	4.03	3.89	4.03
15042	AVG DENS DATA	(TMV) 1.76	1.67	2.10	2.13	2.52
15054	CAL LAMP CUR A	(TMV) 1.06	1.08	1.10	1.09	1.10
15056	BAND 2 ± 15 VDC	(TMV) 5.05	5.10	5.10	4.93	5.10
15058	BAND 4 ± 15 VDC	(TMV) 5.00	5.10	5.10	4.93	5.10
15060	+12 - 6 VDC REG	(TMV) 4.90	4.82	5.02	4.91	4.92
15062	+19 VDC REC OUT	(TMV) 4.81	4.80	5.01	4.89	4.90
15064	BAND 1 HV A	(TMV) 5.21	5.10	5.13	5.01	5.12
15066	BAND 2 HV A	(TMV) 4.46	4.50	4.52	4.42	4.52
15068	BAND 3 HV A	(TMV) 4.58	4.60	4.62	4.52	4.63
15070	SHUT MOT CON OUT	(TMV) 2.46	2.43	2.51	2.44	2.46
15041	A/D CONV REF V	(TMV) 5.82	5.93	5.93	5.80	5.82
15053	SCAN MIR REG V	(TMV) 4.44	4.42	4.63	4.53	4.53
15055	BAND 1 ± 15V	(TMV) 4.94	4.97	4.97	4.86	4.97
15057	BAND 3 ± 15V	(TMV) 4.94	5.00	5.00	4.82	5.00
15059	-15 VDC TEL.	(TMV) 5.02	5.02	5.02	5.02	5.02
15061	± 5 VDC LOGIC REG	(TMV) 4.80	4.82	4.77	4.80	4.80
15063	-19 VDC REG OUT	(TMV) 3.42	3.43	3.50	3.46	3.50
15071	SCAN MIR DR. CLK	(TMV) 1.94	1.93	2.00	1.96	1.97

* THERMAL VACUUM TEST DATA

(HV SUPPLY B NOT USED YET IN ORBIT)

Signal-to-Noise ratios (S/N) for the MSS sensors are derived from calibration wedge data. A typical plot is shown in Figure 17-3. Evaluation of all the sample data shows there has been no major S/N degradations for the MSS sensors. Attempts to derive S/N figures by sun calibration input pulse data were successful in the last three bands.

The MSS sun calibration orbits are listed in Table 17-2.

Mid-scan symmetry is evaluated by commanding mid-scan code on, processing the resultant data to 70 mm film, and measuring the position of the mid-scan along the base line assuming 3220 elements per line. This method was adopted as it yields a measure of Error Bit Rate variations during film processing. The data shows no significant change in scan symmetry (up to orbit 327. A later orbit is presently being evaluated.)

Table 17-2. MSS Sun Calibration Orbits

21	1303
47	1400
89	1497
103	1595
131	1692
214	1790
326	1887
423	1985
521	2082
619	2180
730	2278
814	2375
915	2389
1012	2473
1207	2585

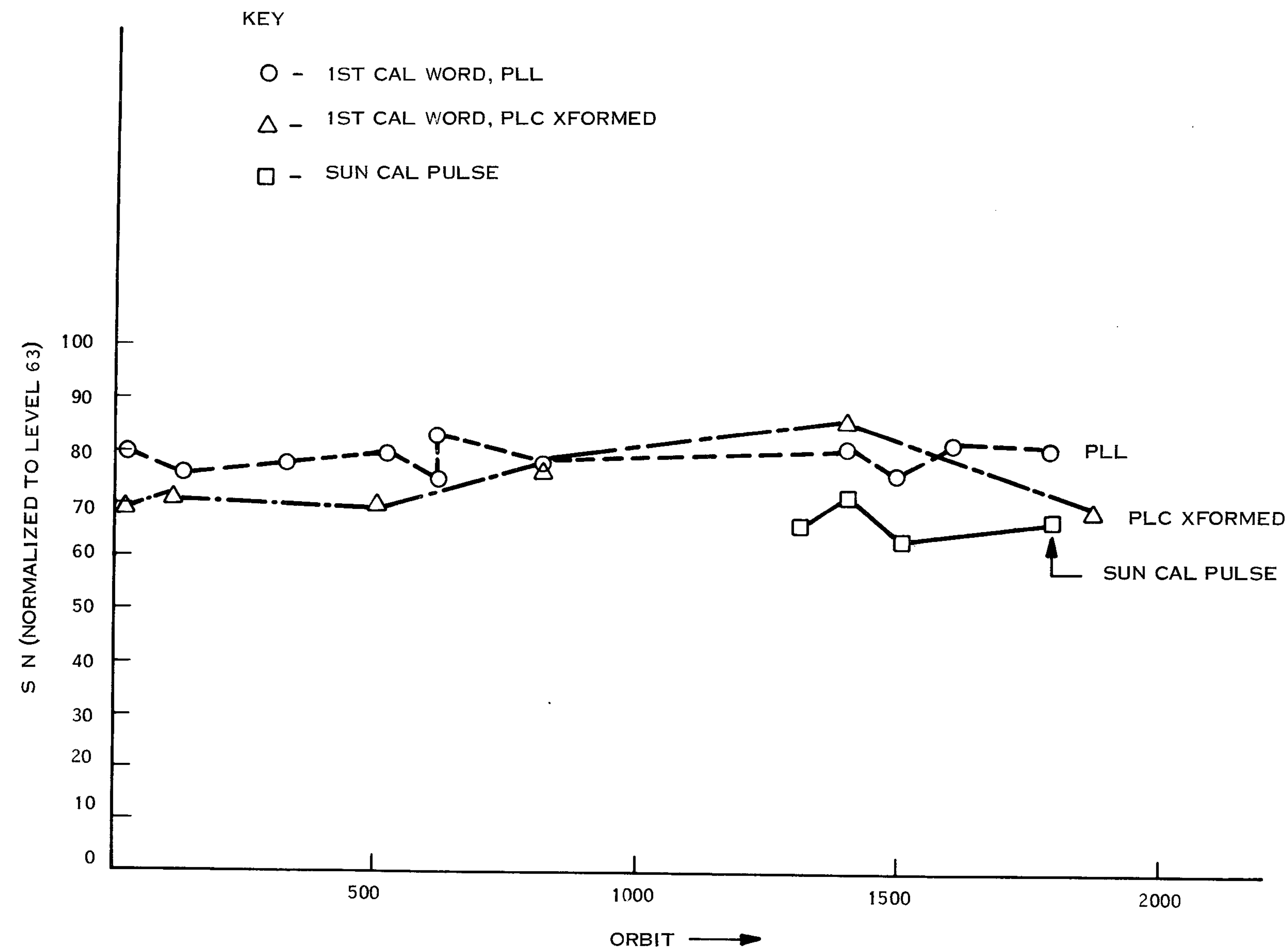


Figure 17-3. CWI, S/N and Sun Calibration S/N

SECTION 18

DATA COLLECTION SUBSYSTEM

The Data Collection Subsystem has operated satisfactorily since launch. Periods of interference have been experienced, and one period of not fully explained decreased activity was observed, but normal operation has followed all such incidents.

All telemetry functions have been normal as shown in the typical values of Table 18-1.

Table 18-1. DCS Telemetry Values

Number	Name	Units	T/V* 20°C Plateau	Value in Orbits			
				16	1581	2035	2599
16001	Revr 1 Sig Str	(DBM)	-119	-124.09	-123.68	-124.47	-124.39
16002	Revr 1 Temp	(DGC)	23.0	22.72	23.67	25.49	24.07
16003	Revr 1 Inp Volt	(VDC)	12.02	12.02	12.02	12.01	12.01

*Thermal Vacuum Test Data

Receiver 2 has not yet been used in orbit.

Cumulatively from launch for this subsystem, 129,750 messages were received of which 119,364 (84.5%) were perfect. Considerable interference, externally generated, was experienced during this reporting period causing the large number of non-perfect messages. In periods without obvious interference, perfect messages exceed 95%. 218 ground platforms have been active, with a maximum of 83 active during one orbit. The maximum number of messages received in one orbit was 384 in Orbit 2523.

Messages are received from 7 or 8 orbits per day at two ground stations, Greenbelt and Goldstone. The average number of messages per orbit has been 100.

Thirty users from the United States and Canada include federal, states, universities and private investigators. Appendix C lists the names, affiliations, and locations of users and platforms.

The DCS Subsystem has been ON since launch for a cumulative total of 4467 hours and 6 minutes.

Reception probability has remained at 99% except for an unusual 9-day period when the probability dropped to 71% after which it rose again to the 99% level.

In the first Quarterly Report (23 July to 23 October 1972) reception from DCS platform 6115 was analyzed for orbits in the third, fourth and fifth 18-day cycles. Table 18-2 compares the messages received from Platform 6115 in this reporting period with those of the same orbital trace received during the prior reporting period. It is seen there was equal probability of reception.

Table 18-3 shows a similar comparison for orbits in the unusual 9-day cycle. It is seen the probability of reception dropped to 71%.

Table 18-2. Comparison of Reception Probability for Platform 6115.

3rd and 4th Cycle Orbits	Mes. Rec.	Mes. Rec.	7th and 9th Cycle Orbits
710	3	3	1714
717	2	3	1721
723	2	2	1727
724	3	3	1728
730	4	4	1734
731	3	2	1735
737	3	3	1741
738	4	3	1742
744	3	4	1748
1002	3	2	2257
1003	2	3	2258
1009	4	4	2264
1010	2	2	2265
1016	2	4	2271
1017	3	4	2272
1022	3	1	2277
1023	4	4	2278
Total	50	51	

Table 18-3. Reception Probability in Unusual 9-Day Period for Platform 6115

3rd, 4th and 5th Cycle Orbits	Mes. Rec.	Mes. Rec.	7th and 8th Cycle Orbits
841	3	3	1845
842	1	2	1846
849	3	3	1853
850	2	2	1854
855	4	3	1859
856	2	4	1860
862	2	1	1866
863	3	3	1867
864	2	1	1868
869	3	2	1873
870	2	4	1874
876	2	2	1880
877	3	2	1881
1143	2	1	1896
1148	3	2	1901
1149	3	-	1902
695	3	2	1950
696	4	0	1951
697	1	0	1952
702	3	2	1957
703	3	1	1958
711	1	0	1966
725	1	0	1980
Total	56	40	

Figure 18-1 shows the history of messages received in a time span including the unusual 9-day period. The trend is shown, the percentage of bad messages are plotted, and the unusual 9-day period is identified.

Figures 18-2 and 18-3 show, for Greenbelt and Goldstone respectively, the messages received for each pass in this unusual 9-day period. Passes 1 through 4 are night-time passes and Passes 5 through 8 are day-time passes. The Greenbelt performance appears to have been most affected. Two contributions to the poor performance can be seen: a

missed ETC orbit in Day 342; and the confluence of at least two 18-day cyclic effects -- the orbital drift out of range of Passes 4 and 7 and the orbital drift to marginal ranges of Passes 1, 2 and 6. Still under investigation are the lower-than-expected number of messages received on all passes. See Table 18-3.

Table 18-4 summarizes the DCS performance to date.

Table 18-4. DCS Performance to Date

Reception probability (norm)	99%
Reception probability (unusual 9-day period)	71.0%
Invalid messages (including long periods of known interference)	15.5%
System threshold	3400 km
Grazing angle effects	None observed
Adjacent DCP performance	No adverse effect
Ground Transmission System	Satisfactory
Data processing system performance (msg. received/msg. delivered)	0.656

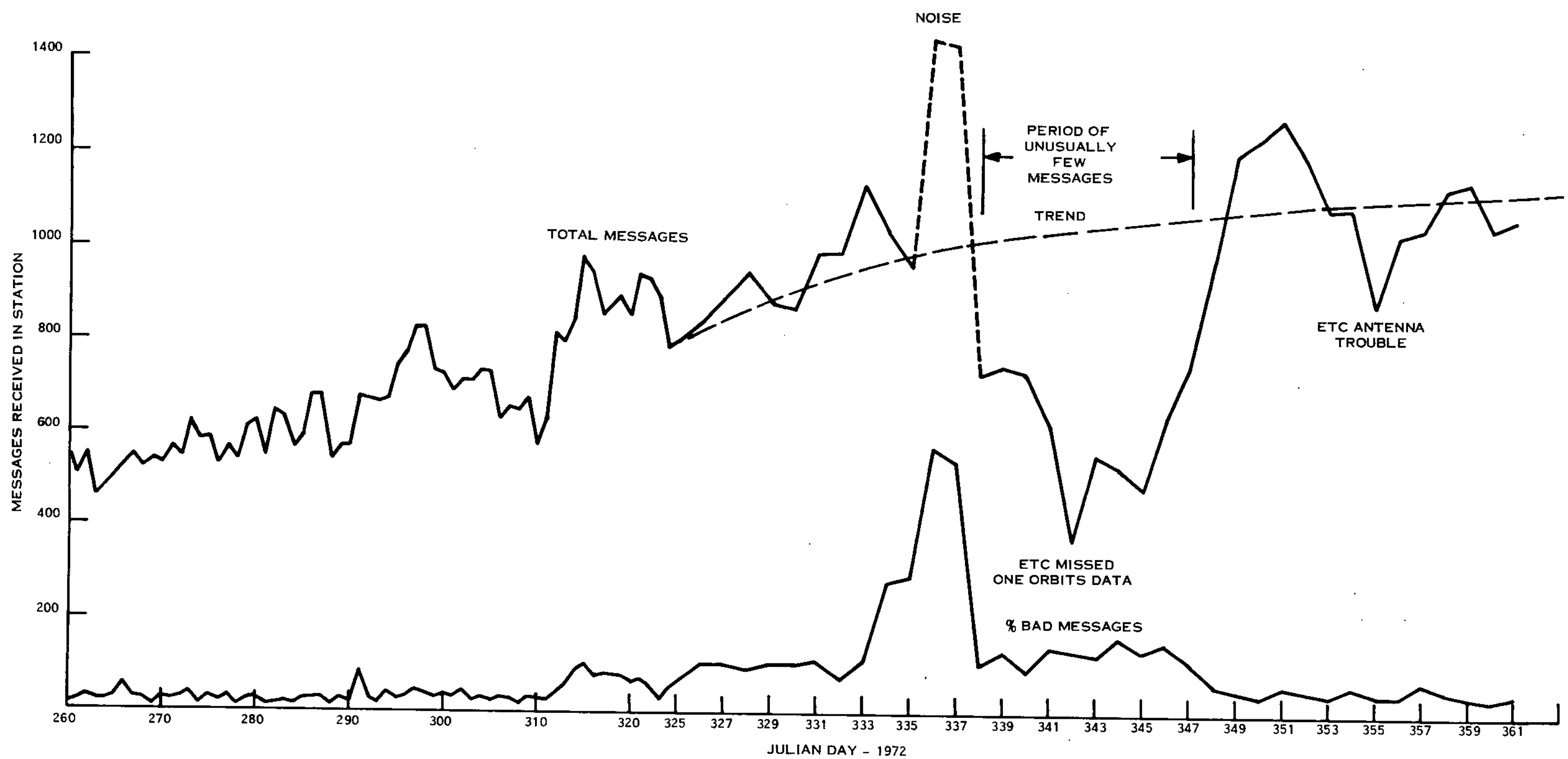


Figure 18-1. DCS Message Receipt History

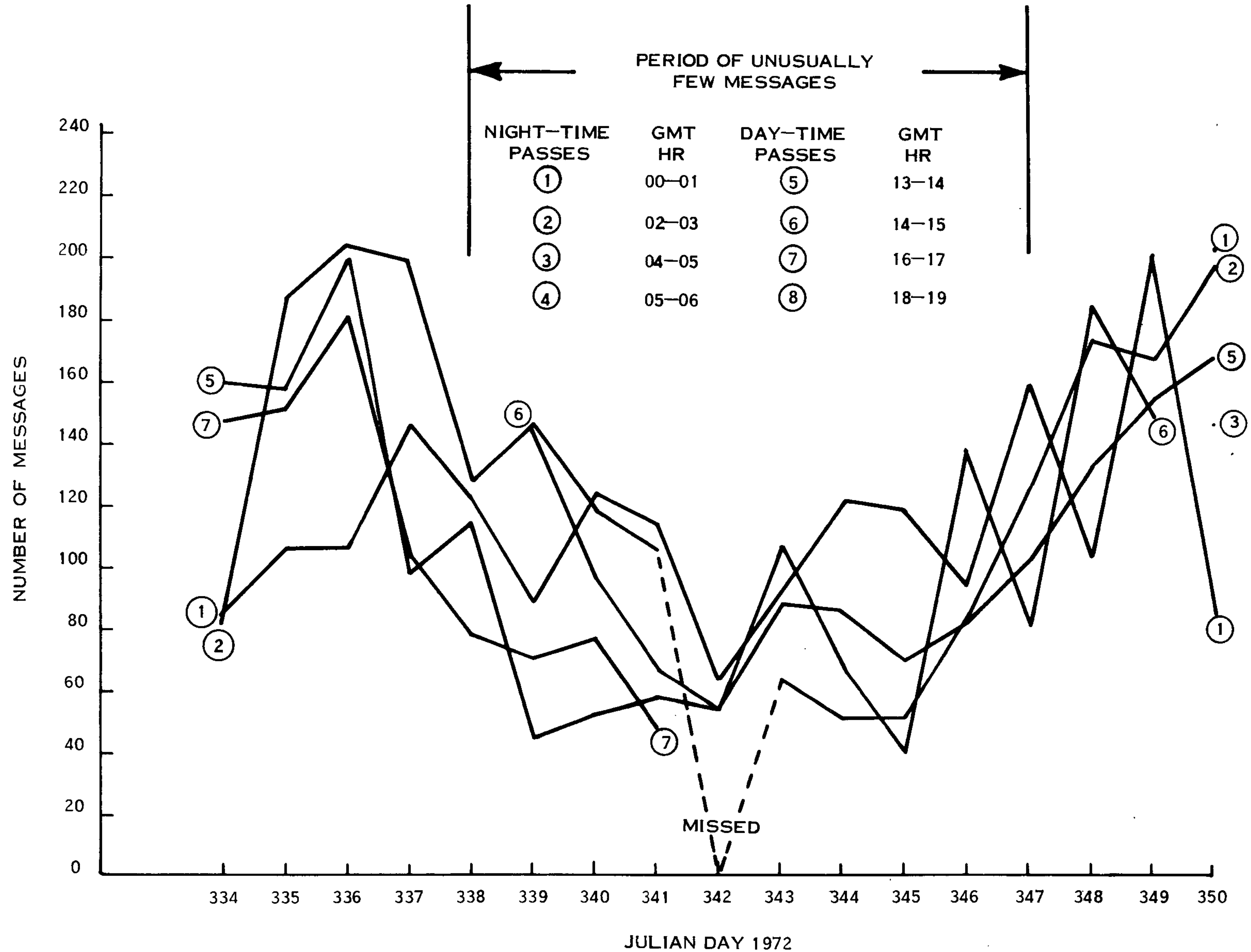


Figure 18-2. ETC DCS Message Reception

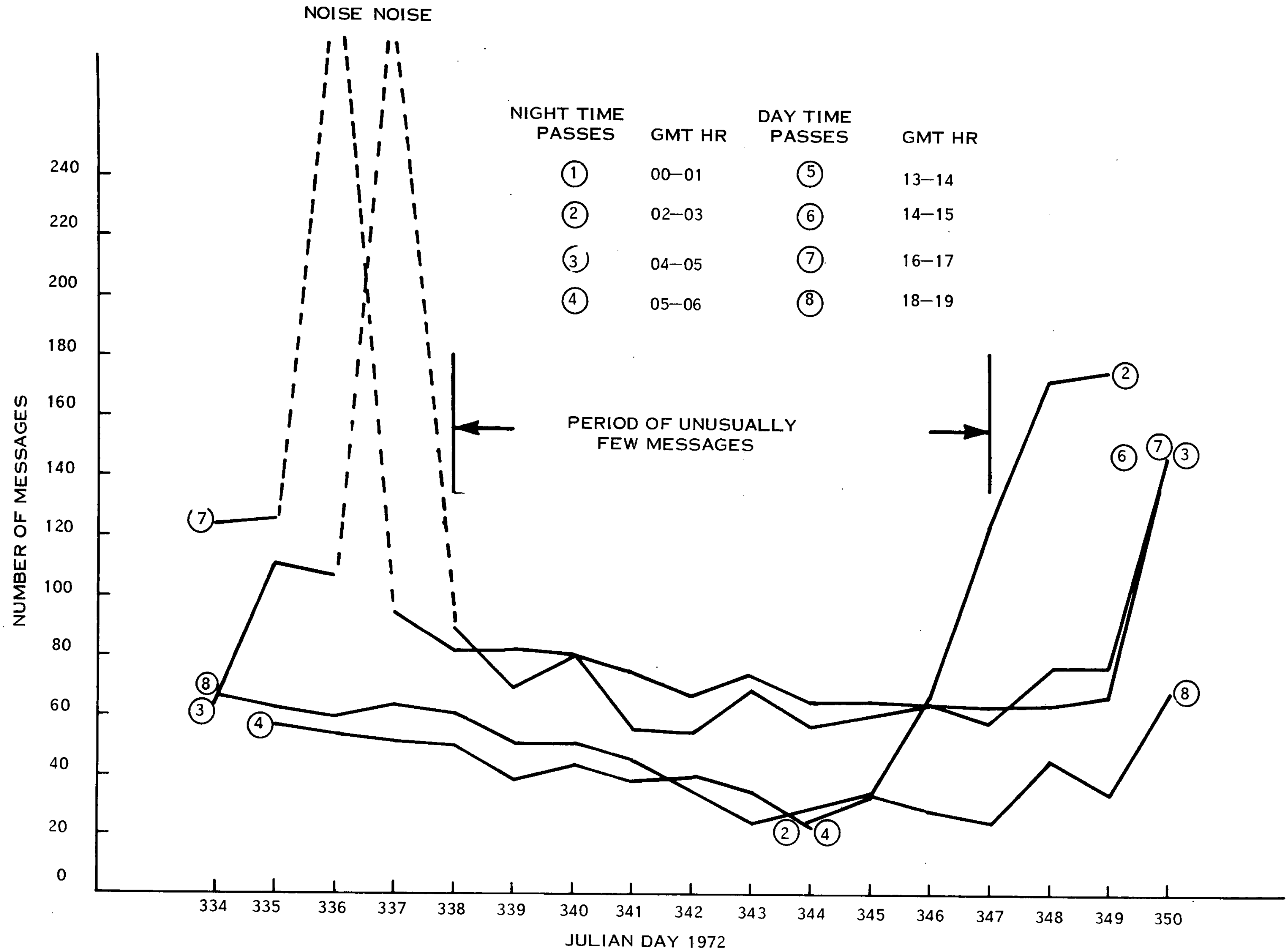


Figure 18-3. GDS DCS Message Reception

APPENDIX A

ERTS-1 ISSUED DOCUMENTS

DOCUMENT NO.	TITLE
72SD4255	ERTS-1 Launch and Flight Activation Report dated 18 October 1972.
72SD4262	ERTS-1 Flight Evaluation Report 23 July to 23 October 1972 dated 28 November 1972.
1TH4-ERTS-72	Solar Flare Activity between 8/2/72 to 8/7/72 dated 11/13/72
1TH4-ERTS-73	Interference to DCS dated 12/7/72
DOSR	ERTS-1 Daily Operation Summary Reports (DOSR) dated (daily)
1THO5-ERTS-2006	MNFS Error WBVTR No. 2 Assessment for Orbits 849 thru 1519 dated 11/16/72
1THO5-ERTS-40S	Cal Wedge Evaluation thru Orbit 1337 from the MSS Peg Performance Program dated 11/28/72
1THO5-ERTS-410	Band 1 cal wedge, Scope Pix Evaluation for Orbit 2076 dated 12/27/72
1THO5-ERTS-416	Cal Wedge Evaluation thru Orbit 1965 from the Peg Performance Program dated 1/26/73
1THO5-ERTS-412	Re-examination of Sun Cal Results, RSE Reporting, and Tape Screening dated 1/3/73
1THO5-ERTS-414	Attempt at Evaluation of The Mux Transfer Function from linear and Compressed Mode Orbits dated 1/23/73
1THO5-ERTS-417	Sun Cal Program Data Collection dated 1/26/73
1HO5-ERTS-418	Evaluation of The Mux Lin/Comp Transfer Functions from Sun Cal Orbits 2375 and 2389 dated 2/1/73

1HO5-ERTS-404	Attempt at Calculation of The S/N Parameters for the ERTS A, MSS from the Sun Cal Pulse Input dated 11/16/72
1HO5-ERTS-407	S/N Parameters for the ERTS A MSS from the Modified Sun Cal Pulse Width Sampling Inputs dated 12/11/72
1HO5-ERTS-411	ERTS A MSS Sensor Noise and Baseline Shifts Reported by ULA and Goldstone Receiving Sites, Examination dated 12/27/72
1HO5-ERTS-415	S/N Calculated from the Sun Cal Pulse Input and the Cal Wedge Histograms dated 1/25/73
1THO5-ERTS-406	MSS Analog Telemetry through Orbit 1681 dated 11/28/72

APPENDIX B

ERTS-1 ANOMALY LIST/REPORTS

ERTS-1 ANOMALY LIST

Since launch, July 23, 1972, the ERTS-1 Spacecraft has exhibited the following problems which are being investigated to establish impact on the ERTS-1 Mission.

Item	Refer to:
1. Thermal Anomaly of right forward sun sensor (orbit 4)	Appendix E ERTS-1 Launch and Activation Report dated 18 October 1972 (72SD4255)
2. Power Transient associated with WBVTR No. 2 (orbits 148, 149)	Section 15 Appendix B, Page B-2 thru B-5 ERTS-1 Flight Evaluation Report 23 July to 23 October 1972. dated 28 November 1972 (72SD4262) Section 15 and Appendix B herein
3. Failure of RBV power circuit to respond to off Command (Orbit 196)	Section 10 Section 16 Appendix B, Page B-6 thru B-14 ERTS-1 Flight Evaluation Report 23 July to 23 October 1972. dated 28 November 1972 (72SD4262) Section 10, 16 and Appendix B herein
4. Intermittant addition of 256 sec., to execute time of Cell 12 in Comstor B	Section 5 ERTS-1 Flight Evaluation Report 23 July to 23 October 1972 dated 28 November 1972 (72SD4262) Section 5 herein
5. Power step-downs in USB transmitter power output.	Section 9 ERTS-1 Flight Evaluation Report 23 July to 23 October 1972 dated 28 November 1972 (72SD4262) Section 9 herein

DOCUMENT NO. 72SD4260
29 DECEMBER 1972

ERTS 1 SPACECRAFT WBVTR ANOMALY BENCH SIMULATION TEST REPORT

TABLE OF CONTENTS

SECTION 1
INTRODUCTION

The investigation of the ERTS 1 Orbit 149 anomaly associated with WBVTR No. 2 was based on four minutes of spacecraft telemetry and RBV video data.

The investigation began by connecting the engineering model WBVTR into Position No. 1 on the BIT board and inserting sufficient noise on the payload bus ground line at the WBVTR No. 2 position to upset the ACS.

The ensuing simulation testing was associated with the WBVTR dc-dc converter, because the noise frequencies determined during the ACS testing were within the bandwidth of the converters' oscillator.

The results of the testing pinpointed the failure as a short between the converters' T2 transformer 8Vdc and 22Vdc taps. The path of the short was through a mounting nut to the recorders' tinned copper ground plane.

SECTION 2

NOISE INJECTION TESTS

2.1 NOISE INJECTION AT THE PRM, VIP AND GROUNDS

Initial tests of this type included injection of noise in series with the PRM-24V output to the WBVTR, in series with the PRM return to the WBVTR, between the PRM return and spacecraft unipoint return, and several locations associated with the spacecraft VIP. In all of the tests discussed herein, the VTR was simulated by a resistive load (unless otherwise noted).

2.1.1 NOISE ON PRM OUTPUT

A sinewave generator was used with the circuit (see Figure 2-1) to induce noise into the system. The signal measured from the PRM bus to its return was stepped between 22 and 200 kHz and at each frequency from zero up to 600 mV. The resulting data did not match that of the flight anomaly.

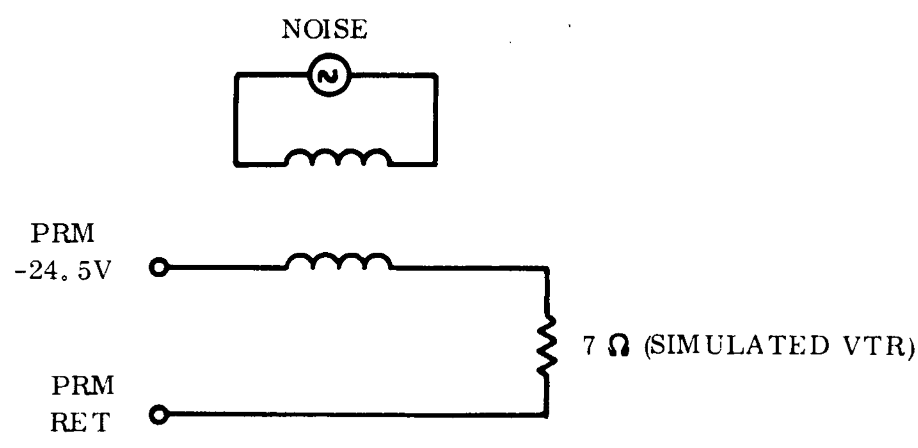


Figure 2-1. Circuit Schematic

2.1.2 NOISE ON PRM RETURN

This test was identical to prior test, except that the noise was coupled into the return side of the simulated WBVTR load. As previously, none of the spacecraft subsystems were affected.

2.1.3 NOISE BETWEEN RETURNS

The data from this series of tests more closely duplicated that of the flight anomaly. The ACS scanners indicated "upside down" as observed in the flight anomaly. Preliminary conclusions were that the ACS scanners were most sensitive to noise that changed frequency rapidly from 24 kHz to 12 kHz. The test setup is shown in Figure 2-2.

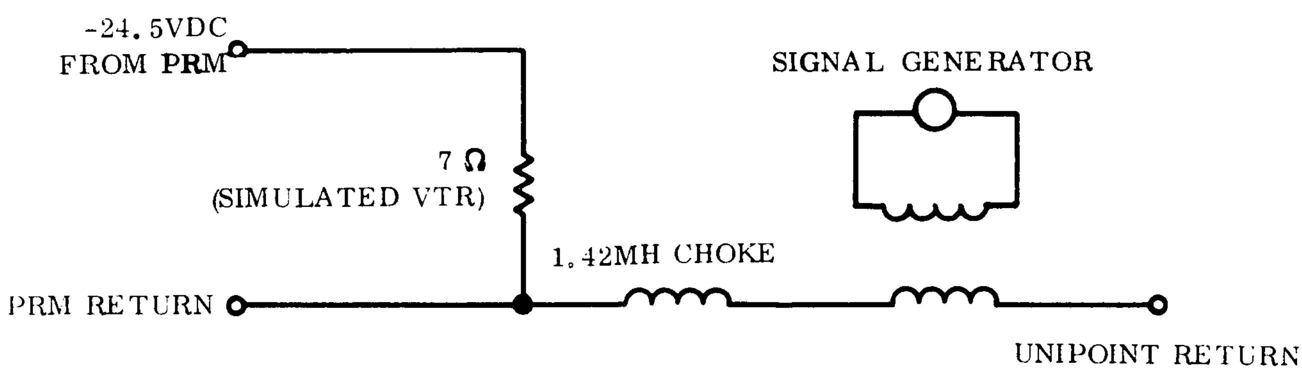


Figure 2-2. Test Setup

The first test was performed using a 22 kHz sine wave for the noise input. The major observation was that ACS data became noisey for most noise levels and that several pitch and roll errors occurred. ACS stimulators were not installed.

The following tables are noise levels measured between the spacecraft bus and the spacecraft bus return, payload bus and payload bus return, and noise between payload return and unipoint return.

S/ C (Volts)	P/ L (Volts)	P/ L to Unipoint (Volts)	Remarks
0.080	0.040	0	Baseline
0.350	0.600	-	Pitch and Roll errors; Very noisy TLM
-	0.500	-	Same as above
0.120	0.200	1.5	Some noisey TLM
0.170	0.300	2.4	Noiser than above
0.210	0.400	3.0	Slight increase in noise
0.275	0.500	4.2	Very noisy
0.250	0.450	4.7	Appears to be threshold

All tests after the first were run with scanners and the scanner go/ no-go heater stimulators. With this setup, the rear scanner gave upside down indications when the noise between returns was 6.5 V or greater. Again the noise stimulus was a 22 kHz sine wave.

S/ C (Volts)	P/ L (Volts)	P/ L to Unipoint (Volts)	Remarks
0.160	0.600	6.5	Rear scanner upside down
0.210	0.800	8.2	No change
0.225	0.900	10.0	No change
0.250	1.200	13.0	No change
-	0.400	-	Rear scanner normal

The next test was run with a 10 kps generator for the noise input. In this setup both scanners indicated upside down. However, as can be seen in the following table, the forward scanner results were somewhat inconclusive.

S/ C (Volts)	P/ L (Volts	P/ L to Unipoint (Volts)	Remarks
0.110	0.380	3.5	Rear scanner upside down
0.180	0.600	5.0	Both scanners upside down
0.110	0.300	3.0	Forward scanner back to normal
-	1.2	-	Forward scanner still normal

The next test showed that the scanners were not only sensitive to noise at a given amplitude and frequency, but also to a rapid shift in frequency from approximately 24 kHz to 12 kHz. Noise input was a sine wave.

Frequency (kHz)	S/ C (Volts)	P/ L (Volts)	P/ L to Unipoint (Volts)	Remarks
200	0.120	0.300	3.0	No problem
100	0.150	0.500	4.0	Noisy data
100	0.180	0.600	5.25	Noisy data
100	0.180	0.700	7.0	Noisy data
40	0.600	1.0	10.0	Noisy data
20	0.200	0.800	8.0	Some scanner noise
15	-	-	-	Almost full earth on both scanners
40	0.400	1.5	-	Both scanners normal
24	-	-	-	Rapid freq change - no problem
12	0.170	0.700	7.0	Rapid freq change - upside down on both scanners

The next test was run to determine at what noise level both scanners would indicate upside down if the frequency was quickly changed from 24 kHz to 12 kHz. In summary, the results showed that for both scanners to saturate, at least 300 mV of noise was required on the payload bus when the frequency shift occurred. Simply raising the noise level to 300 mV after a frequency shift would not cause both scanners to see full earth. The threshold for the rear scanner only was measured to be about 175 mV.

2.1.4 NOISE ON VIP

Noise was introduced into the VIP subsystem in three phases as follows:

1. To both signal and signal return (common mode rejection)
2. Between signal return and unipoint
3. In series with signal

2.1.4.1 Common Mode Rejection

Several WBVTR telemetry signals were simulated by a 3 Vdc battery. Sinusoidal noise was then injected into both the signal line and the signal return. The simulated WBVTR input current telemetry, which is sampled once a second, was used to determine noise effects. Since the frequencies generated were extremely high in relation to VIP sampling, only maximum and minimum points were used in the analysis. From the data, it appears that the noise was merely added to the dc signal input. The results also indicate that common mode injection was best at frequencies below 20 kHz and at 300 kHz. It seemed not to exist at all at 100 and 200 kHz. The results are tabulated in Table 2-1.

2.1.4.2 Ground Noise

In this test, some of the WBVTR No. 2 telemetry points were connected through a 1.5 V battery to the PCM return, simulating full-time telemetry points. The analog mux return was connected as in the first test. The results were similar to those of the first test for both groups of telemetry. See Table 2-2.

Table 2-1. Common Mode Rejection
(All values are TMV unless specified)

Frequency (kHz)	Amp (V_{P-P})	Level* Maximum	Level* Minimum	+Δ	-Δ	±Δ
10	1.0	3.30	3.05	0.13	0.12	0.25
10	2.0	3.60	2.77	0.43	0.40	0.83
10	3.0	3.70	2.67	0.53	0.50	1.03
20	1.0	3.50	2.87	0.33	0.30	0.63
20	2.0	3.50	2.57	0.33	0.60	0.93
20	3.0	3.50	2.57	0.33	0.60	0.93
40	1.0	3.60	2.72	0.43	0.45	0.88
40	2.0	4.00	2.37	0.83	0.75	1.58
40	3.0	4.12	2.25	0.95	0.87	1.82
100	1.0	3.70	2.65	0.53	0.48	1.01
100	2.0	4.25	2.15	1.08	1.02	2.10
100	3.0	4.87	1.55	1.70	1.62	3.32
200	1.0	3.70	2.67	0.53	0.50	1.03
200	2.0	4.20	2.20	1.03	0.97	2.00
200	3.0	4.90	1.80	1.73	1.37	3.10
300	1.0	3.37	3.00	0.20	0.17	0.37
300	2.0	4.00	2.82	0.83	0.35	1.18
300	3.0	4.02	2.37	0.85	0.80	1.65

*Normal steady state T/M level was 3.17 TMV

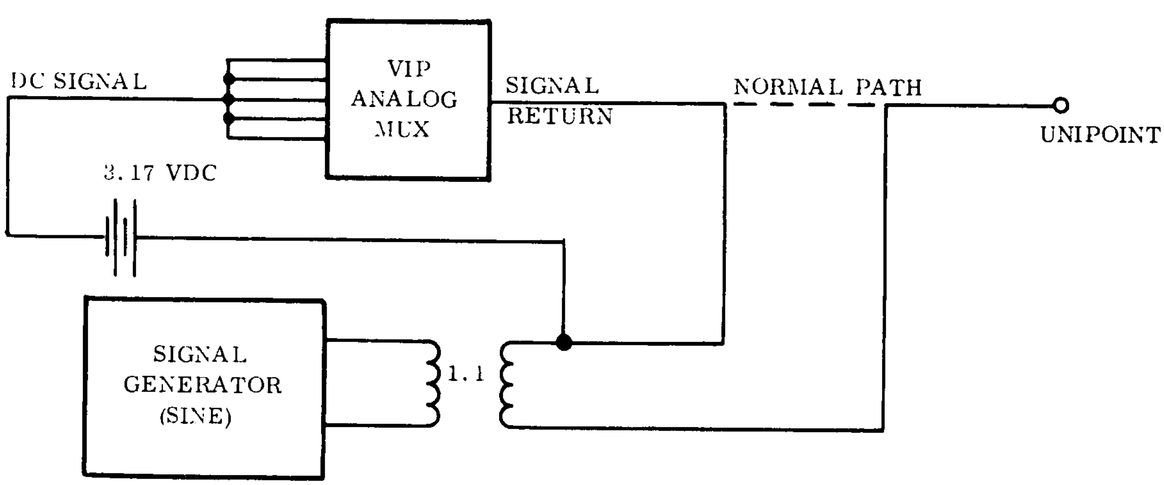
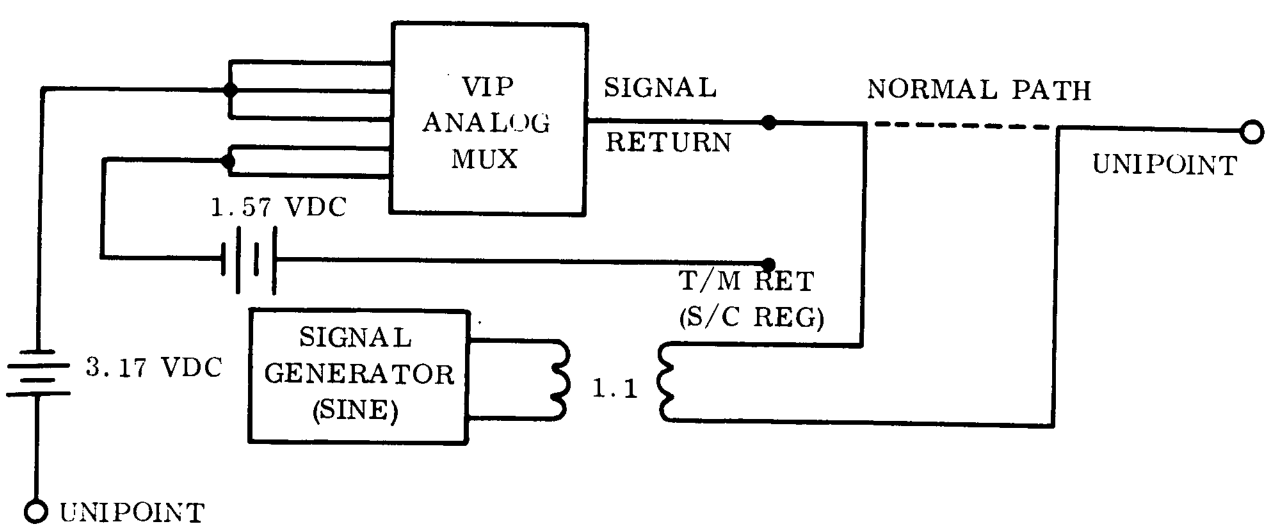


Table 2-2. Noise in Ground
(All values are TMV unless specified)

Frequency (kHz)	Amp (V_{p-p})	Level*		+Δ	-Δ	±Δ	(Normal 1.57)		+Δ	-Δ	±Δ
		Maximum	Minimum				Maximum	Minimum			
10	1.0	3.60	2.77	0.42	0.40	0.82	2.00	1.17	0.52	0.40	0.92
10	2.0	4.02	2.35	0.85	0.82	1.67	2.05	1.17	0.57	0.40	0.97
20	1.0	3.50	2.87	0.32	0.30	0.63	1.77	1.42	0.20	0.15	0.35
20	2.0	3.80	2.82	0.62	0.35	0.97	2.42	0.75	0.85	0.82	1.67
20	3.0	4.80	1.57	1.62	1.60	3.22	3.20	0.70	1.62	0.87	2.50
40	1.0	3.65	2.72	0.47	0.45	0.92	2.00	1.12	0.42	0.45	0.87
40	2.0	4.10	2.27	0.92	0.90	1.82	2.05	0.92	0.47	0.65	1.12
40	3.0	4.12	2.25	0.95	0.92	1.87	2.25	1.12	0.87	0.45	1.32
100	1.0	3.70	2.65	0.52	0.52	1.05	2.10	1.05	0.52	0.52	1.05
100	2.0	4.20	2.20	1.02	0.97	2.00	2.60	0.60	1.02	0.97	3.00
100	3.0	4.80	1.62	1.62	1.55	3.17	3.25	0.00	1.67	1.57+	3.25+
200	1.0	3.65	2.72	0.47	0.45	0.92	1.12	2.05	0.47	0.45	0.92
200	2.0	4.20	2.25	1.02	0.92	1.95	2.60	0.62	1.02	0.95	1.97
200	3.0	4.80	1.87	1.62	1.30	2.92	3.20	0.27	1.62	1.30	2.92
300	1.0	3.40	2.97	0.22	0.20	0.42	1.62	1.37	0.05	0.20	0.25
300	2.0	4.00	2.37	0.82	0.80	1.62	2.90	0.77	0.82	0.80	1.62
300	3.0	4.40	2.37	1.22	0.80	2.02	3.00	0.57	1.42	1.00	2.42

*Normal steady state T/M level was 3.17 TMV.



2.1.4.3 Signal Noise

The setup for this test was the same as for the second test, except noise was injected only at the return of the 3 V group. The results showed noise rejection increasing with frequency for both groups, and coupled noise in the 1.5 V group a factor of 10 below that of the stimulated group (see Table 2-3).

2.2 BIAS AND NOISE

The purpose of this test was to determine the effect on the system of bias and noise between Payload Return and unipoint, and between WBVTR chassis and unipoint.

The test was run twice; first, on September 16, 1972, and then on September 26, 1972.

Figure 2-3 shows the test circuit used to introduce the bias and noise between P/ L return and WBVTR unipoint. The engineering model was connected into the No. 1 position on the BIT Board and the bias and noise were introduced at the WBVTR No. 2 power interface.

Voltage measurements were (ac and dc) made from S/ C regulator return (A) and WBVTR No. 2 signal return (B) to unipoint.

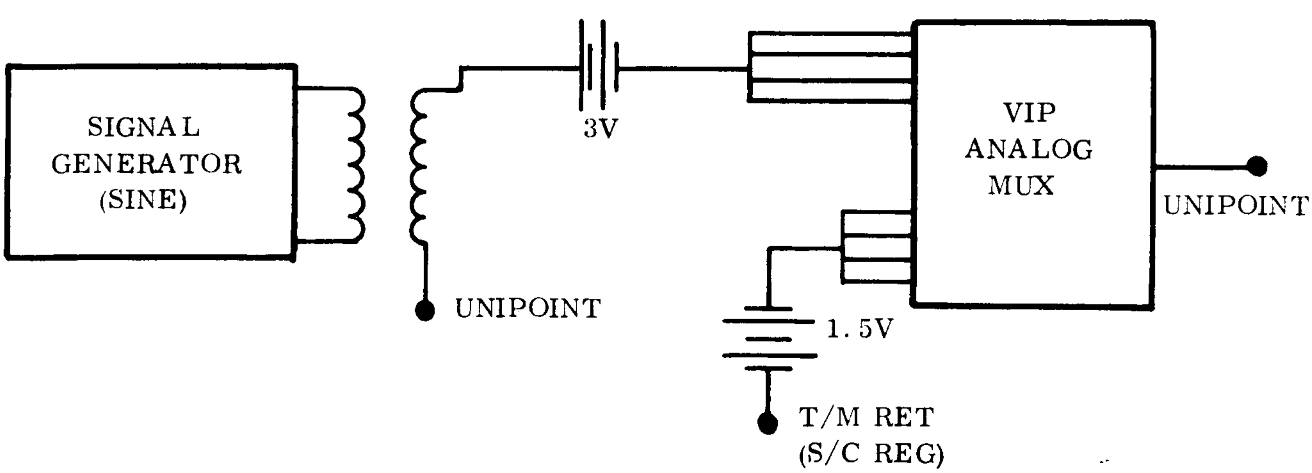
To introduce the bias and noise between chassis and unipoint, Point A on Figure 2-3 was disconnected from P/ L return (P5W48-A, B, P & R), and connected to the BIT Board chassis return.

The same procedure was followed in both the September 16 test and the September 26 test. The (RBV) was commanded on and the WBVTR No. 2 power relay in the PSM was commanded on. The dc supply was adjusted to produce approximately 1/ 2 V of dc offset between the WBVTR No. 2 signal ground and unipoint. The ac signal was increased in steps until the telemetry indicated that the scanners were indicating upside down. This was done at two frequencies: 12 kHz and 22 kHz.

Table 2-3. Noise in Signal
(All values are TMV unless specified)

Frequency (kHz)	Amp (V_{p-p})	Level*		+Δ	-Δ	±Δ	(Normal 1.57)		+Δ	-Δ	±Δ
		Maximum	Minimum				Maximum	Minimum			
10	1.0	3.60	2.77	0.43	0.39	0.82	1.60	1.55	0.02	0.02	0.05
10	2.0	4.02	2.35	0.85	0.82	1.67	1.60	1.55	0.02	0.02	0.05
10	3.0	4.12	2.25	0.95	0.92	1.87	1.65	1.52	0.07	0.05	0.12
20	1.0	3.50	2.87	0.33	0.30	0.63	1.62	1.55	0.05	0.02	0.07
20	2.0	3.50	2.87	0.33	0.30	0.63	1.65	1.52	0.07	0.05	0.12
20	3.0	3.80	2.57	0.63	0.60	1.23	1.67	1.47	0.10	0.10	0.20
40	1.0	3.32	3.05	0.15	0.12	0.27	1.60	1.55	0.02	0.02	0.05
40	2.0	3.65	2.72	0.48	0.45	0.93	1.65	1.52	0.07	0.05	0.12
40	3.0	4.00	2.37	0.83	0.80	1.63	1.65	1.52	0.07	0.05	0.12
100	1.0	3.30	3.07	0.13	0.10	0.23	1.60	1.55	0.02	0.02	0.05
100	2.0	3.42	2.95	0.25	0.22	0.47	1.62	1.52	0.05	0.05	0.10
100	3.0	3.55	2.85	0.38	0.32	0.70	1.65	1.52	0.07	0.05	0.12
200	1.0	3.22	3.15	0.05	0.02	0.07	1.57	1.57	0	0	0
200	2.0	3.25	3.10	0.08	0.07	0.09	1.60	1.55	0.02	0.02	0.05
200	3.0	3.30	3.05	0.13	0.12	0.25	1.60	1.55	0.02	0.02	0.05
300	1.0	3.20	3.15	0.03	0.02	0.05	1.57	1.57	0	0	0
300	2.0	3.22	3.12	0.05	0.05	0.10	1.60	1.57	0.02	0	0.02
300	2.0	3.25	3.12	0.08	0.05	0.13	1.60	1.57	0.02	0	0.02

*Normal steady state T/M level was 3.17 TMV.



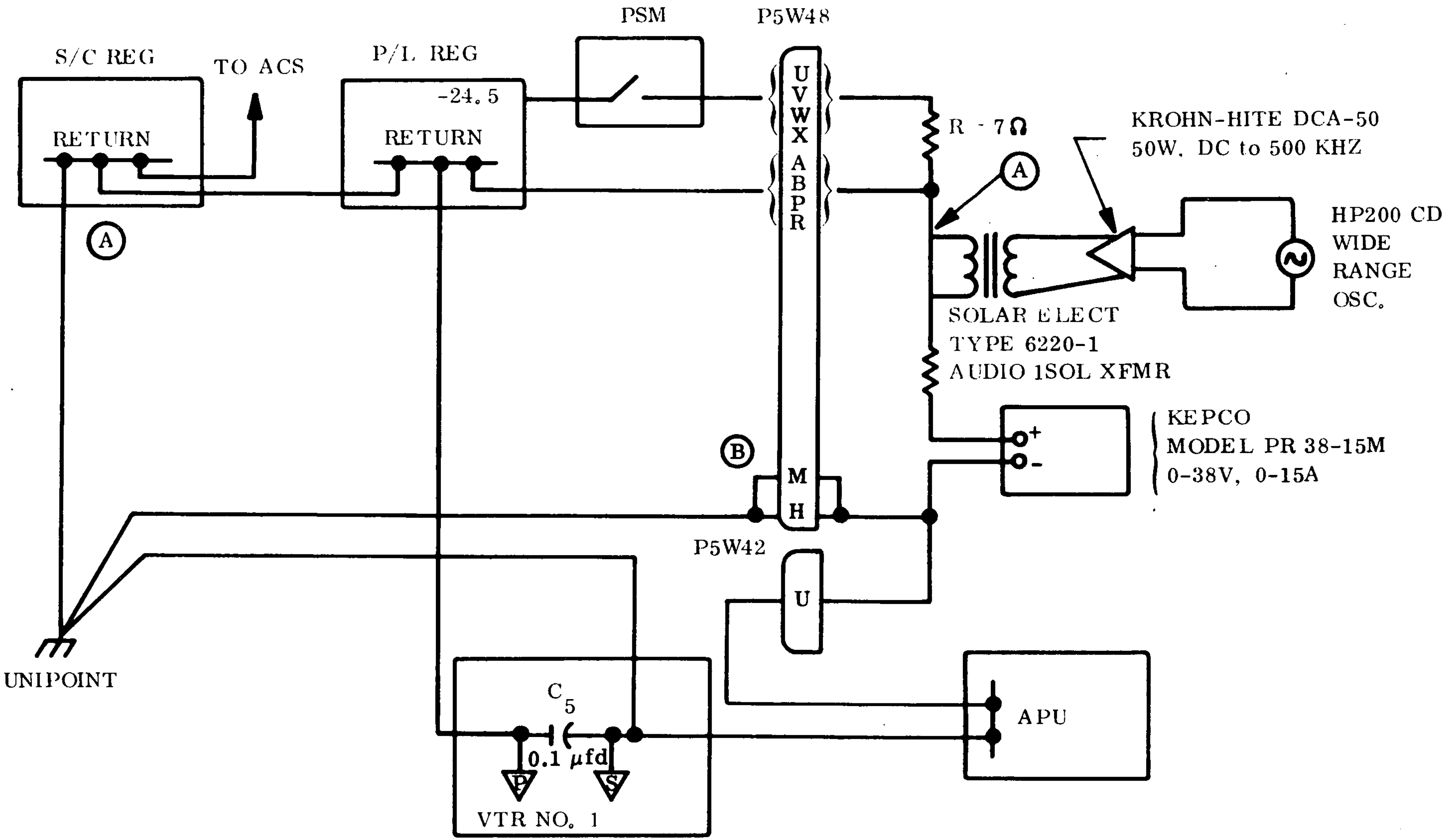


Figure 2-3. BIT Board Test Setup Used to Introduce Bias and Noise Between Payload Bus Return and Unipoint

In both tests, the results show that the ACS scanners indicated upside down when the noise reached a level of 350 mV peak-to-peak at 12 kHz from S/ C return to unipoint. When the frequency was raised to 22 kHz the noise required was 750 mV peak-to-peak. The values were repeated a number of times during each day's test.

After the level required to upset the ACS was determined (350 mV at 12 kHz and 750 mV at 22 kHz). WBVTR No. 1 was commanded on and placed in RBV record. A recording of RBV data was made while the required noise was being induced in the system, and the ACS was indicating upside down. During this time, the output of the RBV was monitored on a scope, and no noise was observed. At the end of the record period, the noise was removed and the WBVTR played back. The RBV playback data from WBVTR No. 1 was observed in the same manner as had the real-time RBV data at the time of recording. This play-back data very clearly exhibited the noise being induced in the system.

All of the aforementioned testing was performed with the noise being introduced between P/ L return and unipoint. When the noise and bias were introduced between chassis and unipoint, it was found that higher driving levels of noise were required to produce significant noise between return and unipoint. In fact, with the noise generating equipment available it was not possible to produce sufficient noise between return and unipoint to cause the ACS to indicate upside down.

This difference in affect between P/ L return and chassis can be more clearly seen by an analysis of the two test configurations. Figures 2-4 and 2-5 are simplified schematics of the P/ L return to unipoint and the chassis to unipoint circuits. All resistances shown are wire resistances and are in the low milliohm range. The capacitor is C5 of the WBVTR dc/ dc converter (from primary to secondary return) and is 0.1 μfd (approximately 80 Ω at 20 kHz).

Note that in the P/ L return to unipoint case (see Figure 2-4) all the noise current flows between S/ C return and unipoint, except that which flows through C5 (a very small percentage of the total current). In the chassis to unipoint case (see Figure 2-5), however, the only portion of the noise current that flows between return and unipoint is that which does flow through C5.

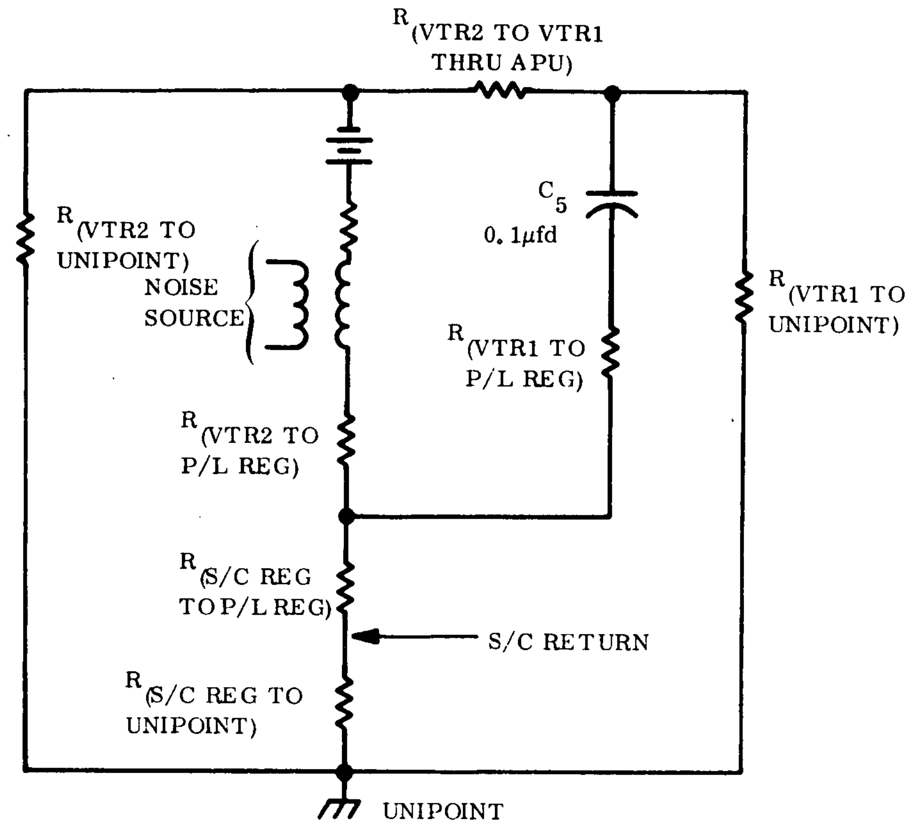


Figure 2-4. Simplified Schematic of Return to Unipoint

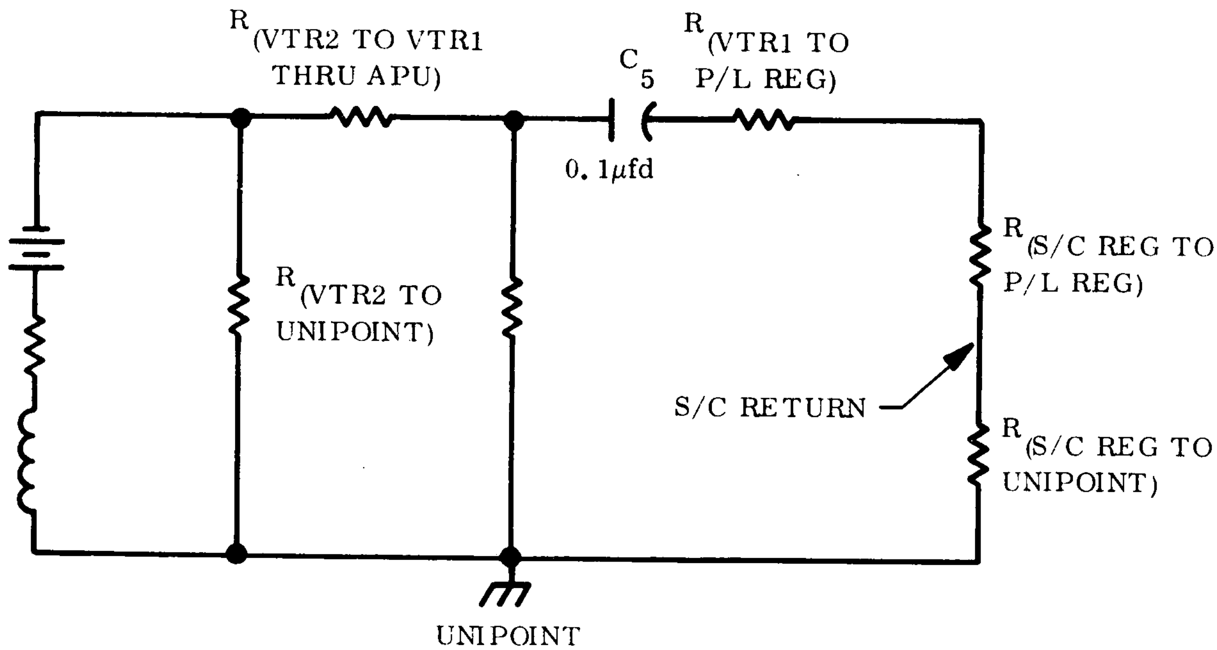


Figure 2-5. Simplified Schematic of Chassis to Unipoint

SECTION 3

WBVTR ANOMALY SIMULATION

The investigation of the WBVTR No. ERTS 1 anomaly in Orbit 149 was based on four minutes of spacecraft data telemetered during the period that the anomalous behavior existed, five minutes of RBV video data for the same period, and the fact that the problem began with turn-on of WBVTR No. 2 in Orbit 149.

The investigation began by connecting the engineering model WBVTR into recorder Position No. 1 on the BIT board and inserting sufficient noise on the payload bus ground line at the Recorder No. 2 position to upset the ACS. The results showed that the amplitude required was a function of frequency as measured from spacecraft ground to unipoint.

The simulation testing was associated with the WBVTR dc-dc converter because the noise frequencies determined during the ACS testing were within the bandwidth of converter's oscillator. A schematic of the dc-dc converter is shown in Figure 3-1.

3.1 WBVTR COMPONENT TESTING

Testing of the recorder began by shorting Capacitor C3. This test developed the required frequency (20 kHz), but produced insufficient voltage ($1.3V_{P-P}$). Capacitors C3 and C5 were then shorted with the signal ground open. The same results were obtained.

A -24.5 Vdc payload regulated bus voltage was shorted through 5 Ω to signal ground with signal ground to unipoint open. A 0.7 Volt dc recorder telemetry signal offset was the result.

The +8 Vdc at the junction of Diodes CR-3 and CR-7 was shorted to chassis ground through resistances ranging from 2.5 to 0.4 Ω. This short produced a slight dc recorder telemetry offset with noise initially at 40 kHz and changing to 20 kHz after 3 minutes. Shorting +5.6 Vdc in the same manner yielded the same results. The minimum resistance for the short that would still permit the recorder to function was 0.19 Ω. Using the same approach, +22 Vdc was shorted to chassis ground through resistances down to 2.0 Ω, the minimum that

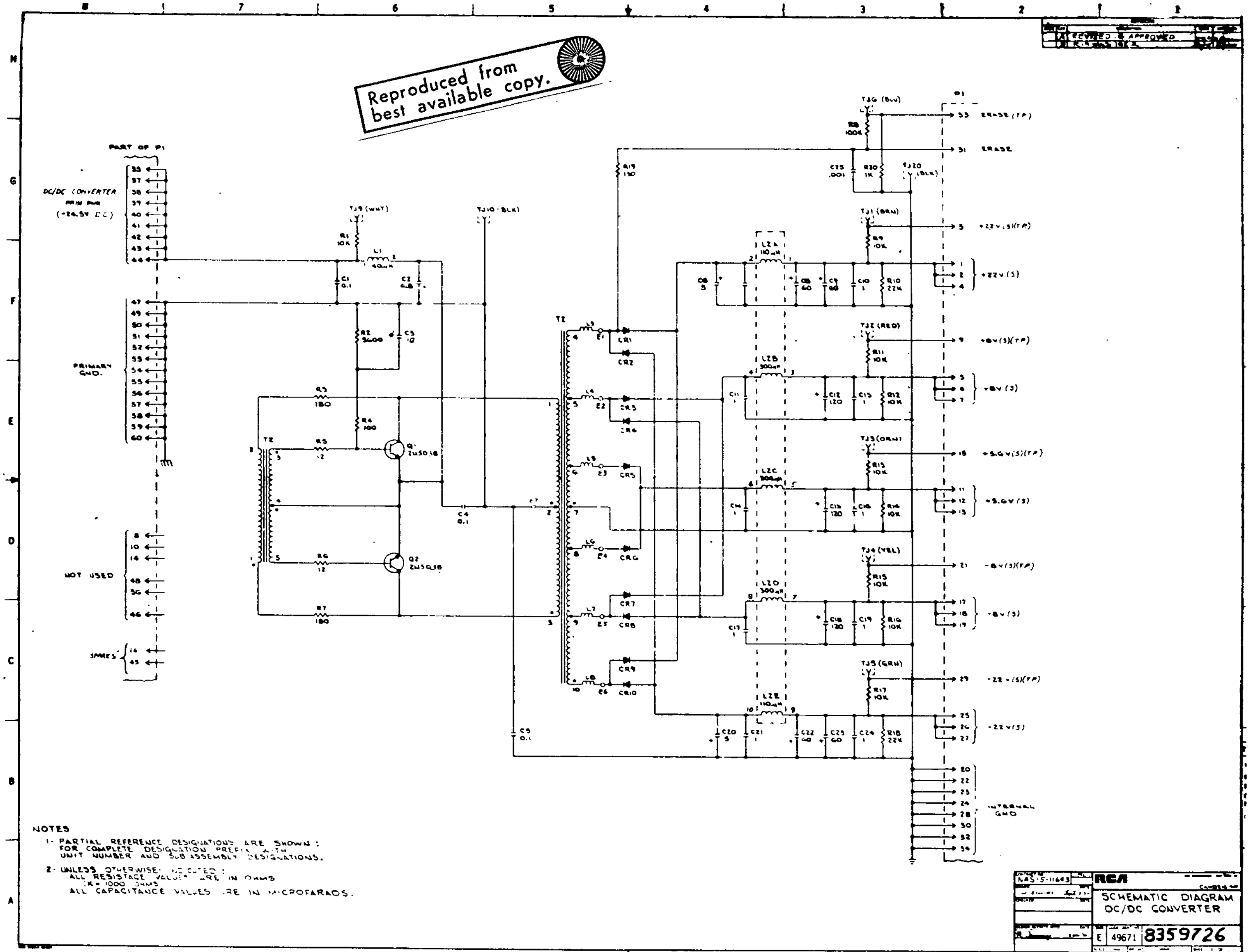


Figure 3-1. WBVTR DC-DC Converter Schematic

would permit the recorder to operate. This test eliminated a short of the + 22 Vdc as the cause of the problem because it produced very little noise and only a slight recorder dc telemetry offset.

3.2 WBVTR SYSTEM TESTING

All affected subsystems were integrated onto the BIT board to obtain subsystem reactions to the simulation testing.

RBV video was recorded on Recorder No. 1 while the +8 Vdc of Recorder No. 2 was shorted to payload ground through 0.25 Ω. RBV video showed very little noise content; a 0.25 Vdc Recorder No. 2 telemetry offset was apparent. This test was repeated with signal ground shorted to unipoint through 0.7 Ω. This test resulted in a 2.5 Vdc offset in Recorder No. 2 telemetry with only slightly perceptible video noise.

The two previous tests were combined by concurrently shorting the +8 Vdc to payload ground through 0.13 Ω and signal ground to unipoint through 0.17 Ω. This test induced 0.15 V_{P-P} noise on the RBV video recorded on Recorder No. 1 and a 2.35 Vdc offset in Recorder No. 2 telemetry signal levels.

Using minimum resistances necessary to sustain recorder operation, the + 5.6 Vdc, + 8 Vdc, and + 22 Vdc lines on the load side of the inductors were shorted to payload ground. This reduced the noise level at the spacecraft ground to unipoint by 5 to 1 in all cases, thereby eliminating the possibility of a short on the load side of the dc-dc converter.

The + 8 Vdc was then shorted through 0.27 Ω total to chassis ground and allowed to run for 4 minutes after which the noise level in the RBV video recorded on Recorder No. 1 reached 0.2 V_{P-P}. Shorting the + 8 Vdc through 0.37 Ω to payload ground for 4 minutes produced video noise amplitude of 0.4 V_{P-P}.

The testing thus far failed to affect the Recorder No. 2 + 5.6 Vdc and servo voltage telemetry signals, to upset the ACS and to cause appreciable offsets in the Recorder No. 1 telemetry signals.

In the final tests, the secondary winding of the dc-dc converter transformer T-2 was shorted to payload ground through a 0.1 to 0.25Ω resistance. Shorting the 8 V tap produced 20 kHz to 40 kHz noise depending on the resistance of the short. At an amplitude of 15 V_{P-P} from payload bus return to unipoint and 0.7 V_{P-P} from spacecraft bus return to unipoint. The ACS was upset, but insufficient noise was generated to cause the V pass to differentiate the video (see Figure 3-3). Figure 3-4 shows a correlation of WBVTR, Power and ACS brush telemetry signatures obtained during the Orbit 149 anomaly and during the 22 Vdc tap BIT board short simulation.

The results of shorting the T-2 transformer 22 Vdc and 8 Vdc taps led to the conclusion that the short was between these two taps. Figure 3-5 illustrates the mechanism by which the short occurred.

8V GROUND SIMULATION

ORBIT 149

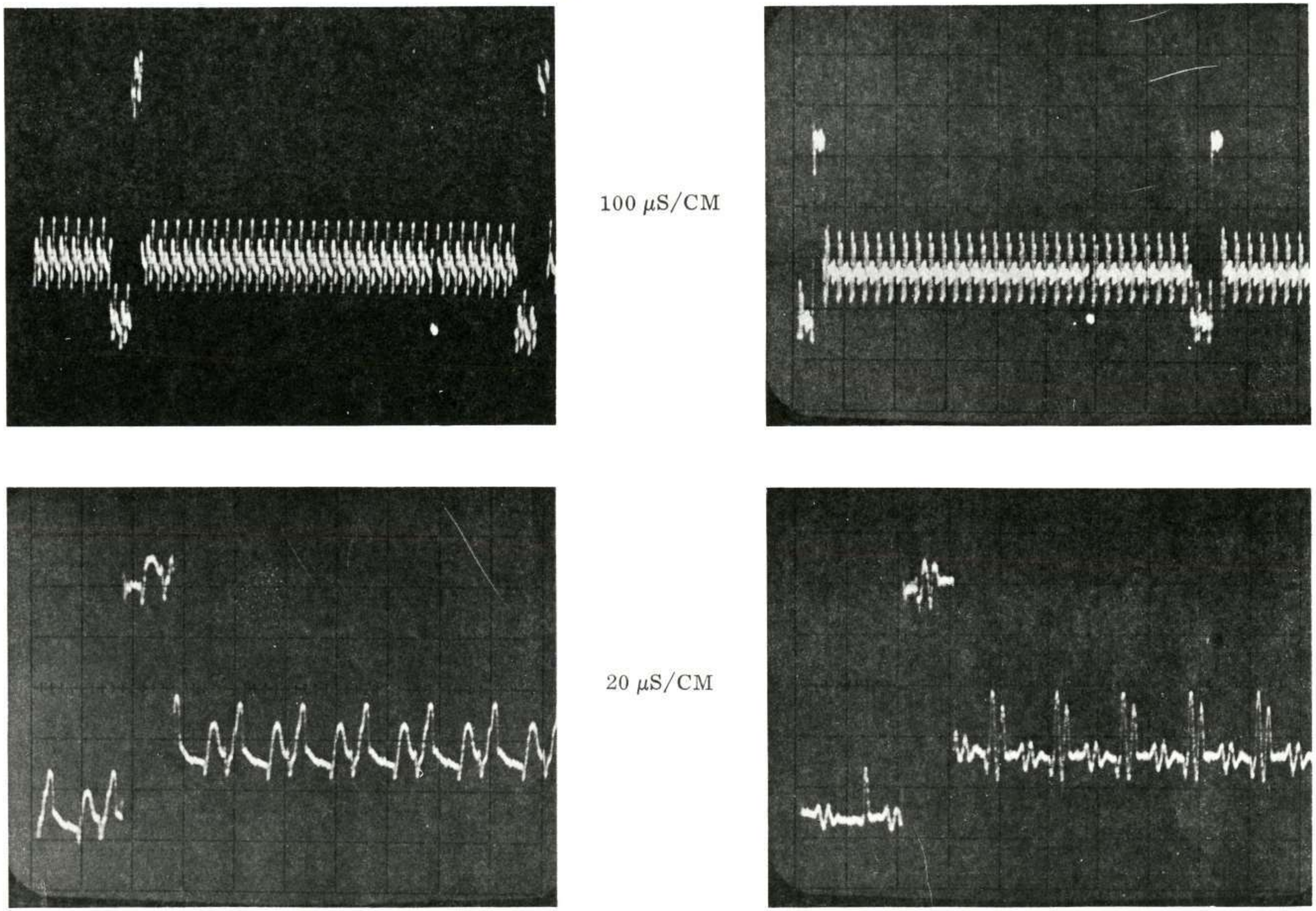


Figure 3-2. Photographs Showing Correlation or Orbit 149 RBV Video and That Recorded During BIT Board 8 Vdc Tap Short Simulation

22V GROUND SIMULATION

ORBIT 149

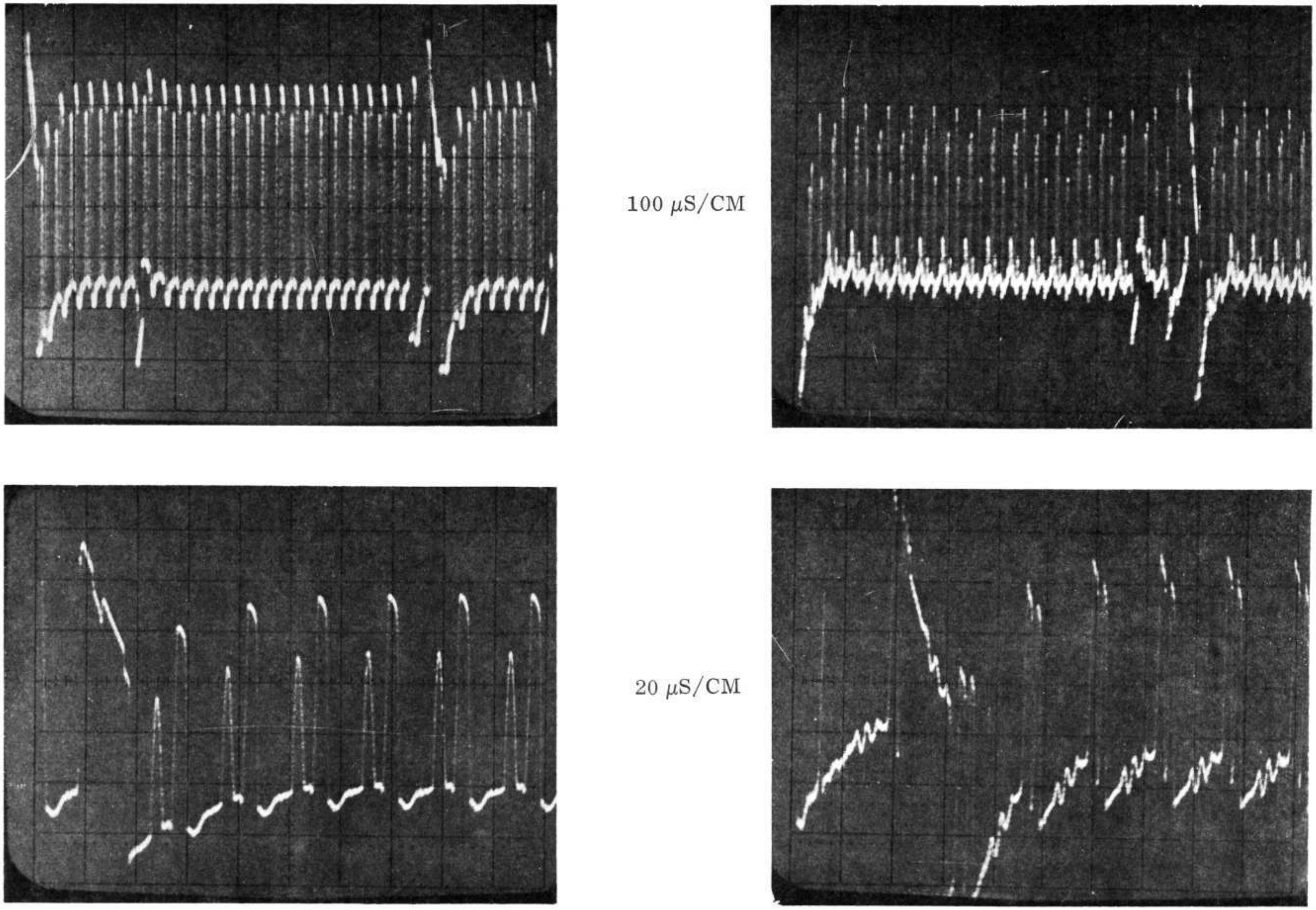


Figure 3-3. Photographs Showing Correlation of Orbit 149 RBV Video and That Recorded During BIT Board 22 Vdc Tap Short Simulation

22V Tap to Payload Ground Simulation

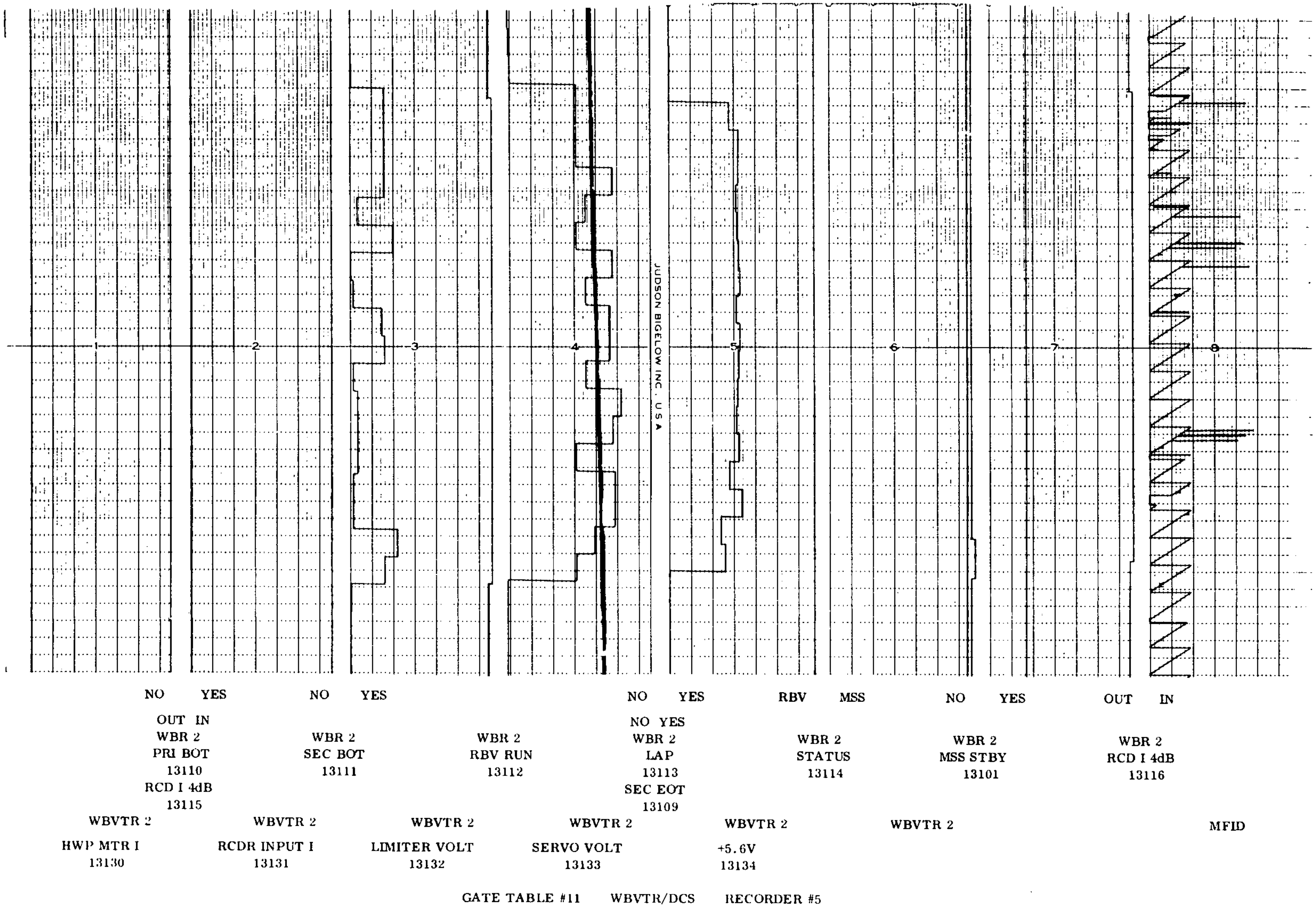


Figure 3-4. Correlation of WBVTR No. 2 Telemetry Signatures Obtained During the Orbit 149 Anomaly and During the 22 Vdc Tap BIT Board Short Simulation (Sheet 1 of 6)

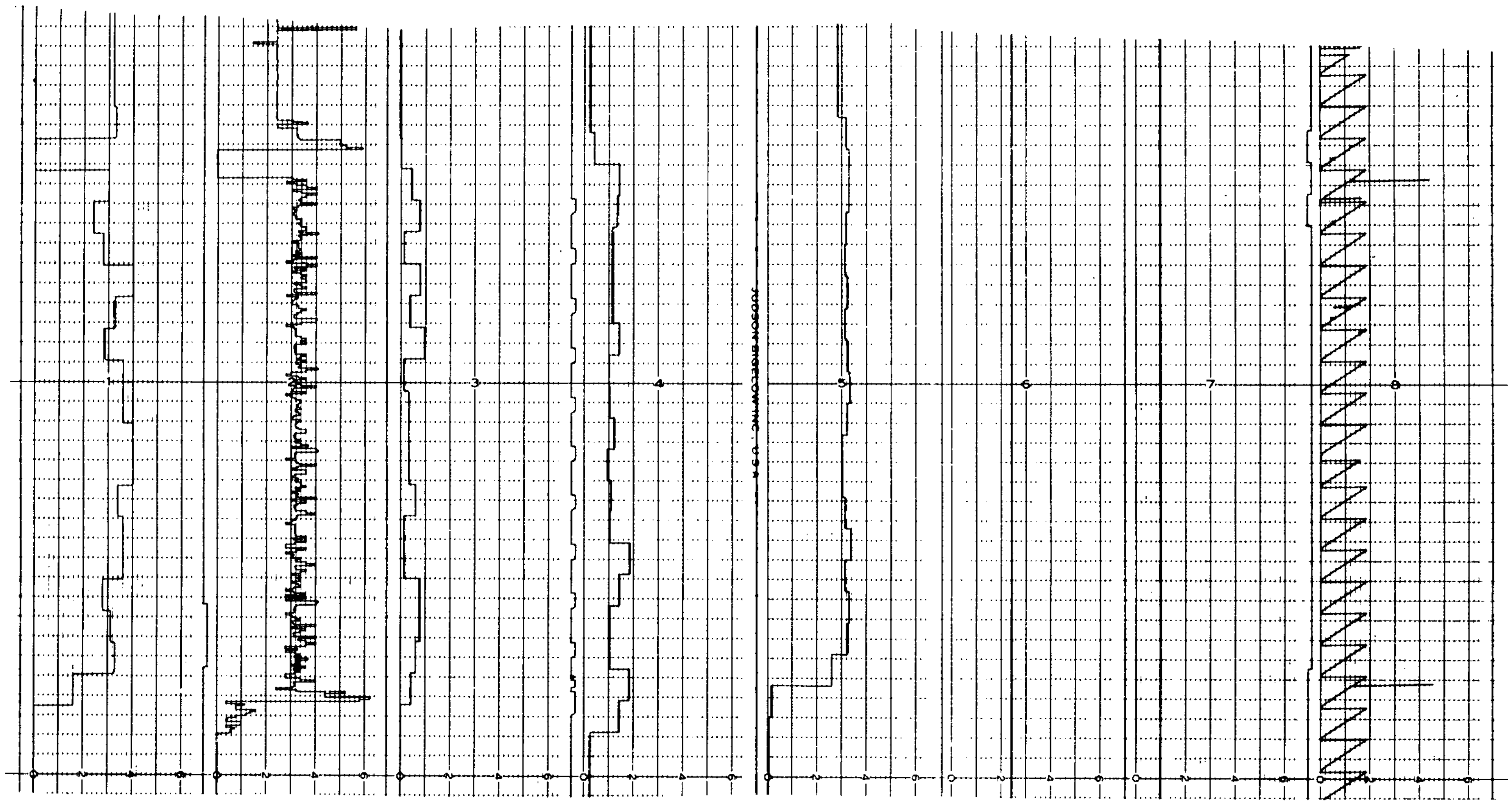


Figure 3-4. Correlation of WBVTR No. 1 Telemetry Signatures Obtained During the Orbit 149 Anomaly and During the 22 Vdc Tap BIT Board Short Simulation (Sheet 2 of 6)

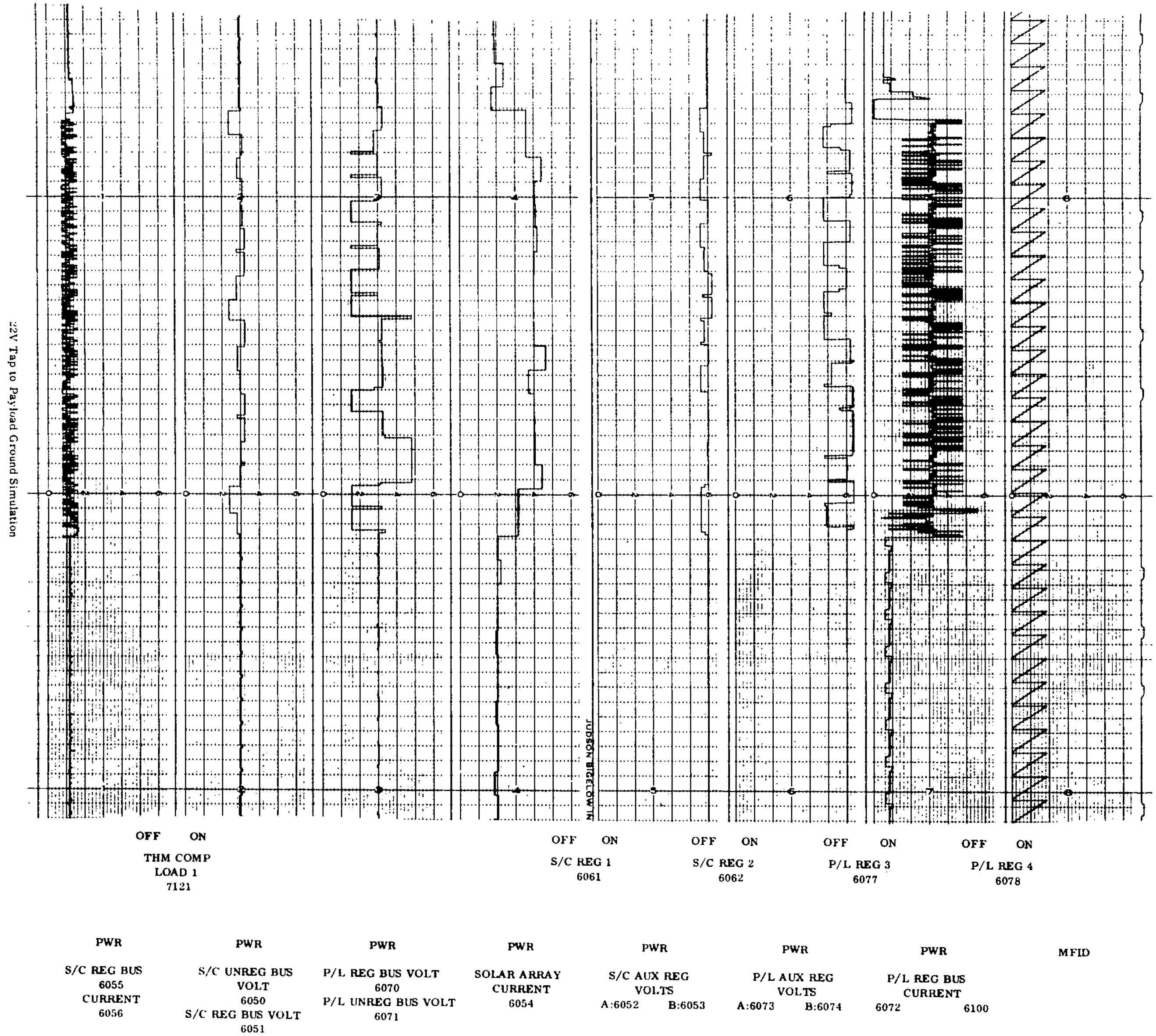


Figure 3-4. Correlation of Power Telemetry Signatures Obtained During the Orbit 149 Anomaly and During 22 Vdc Tap BIT Board Short Simulation (Sheet 3 of 6)

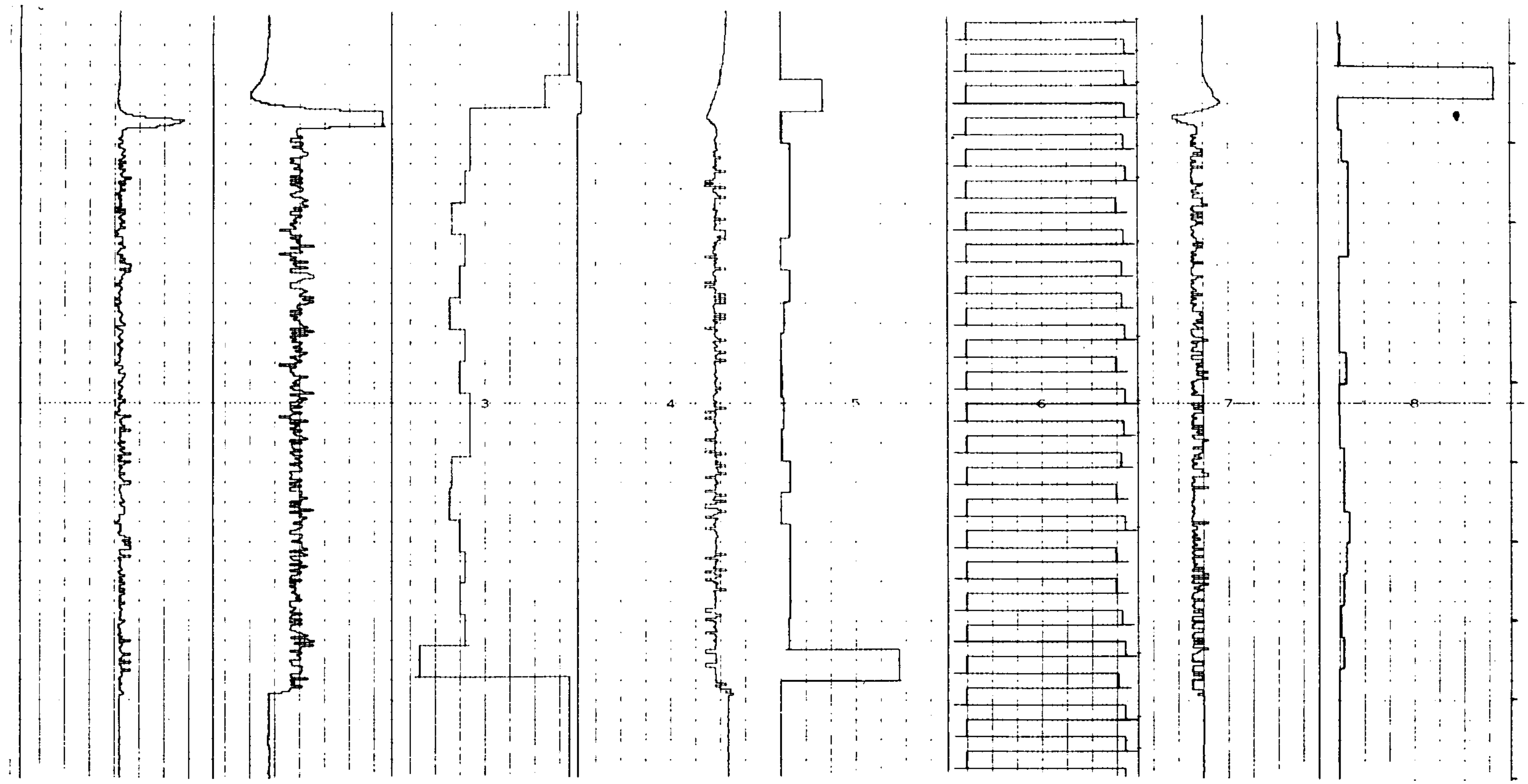


Figure 3-4. Correlation of ACS Telemetry Signatures Obtained During the Orbit 149 Anomaly and During the 22 Vdc Tap BIT Board Short Simulation (Sheet 4 of 6)

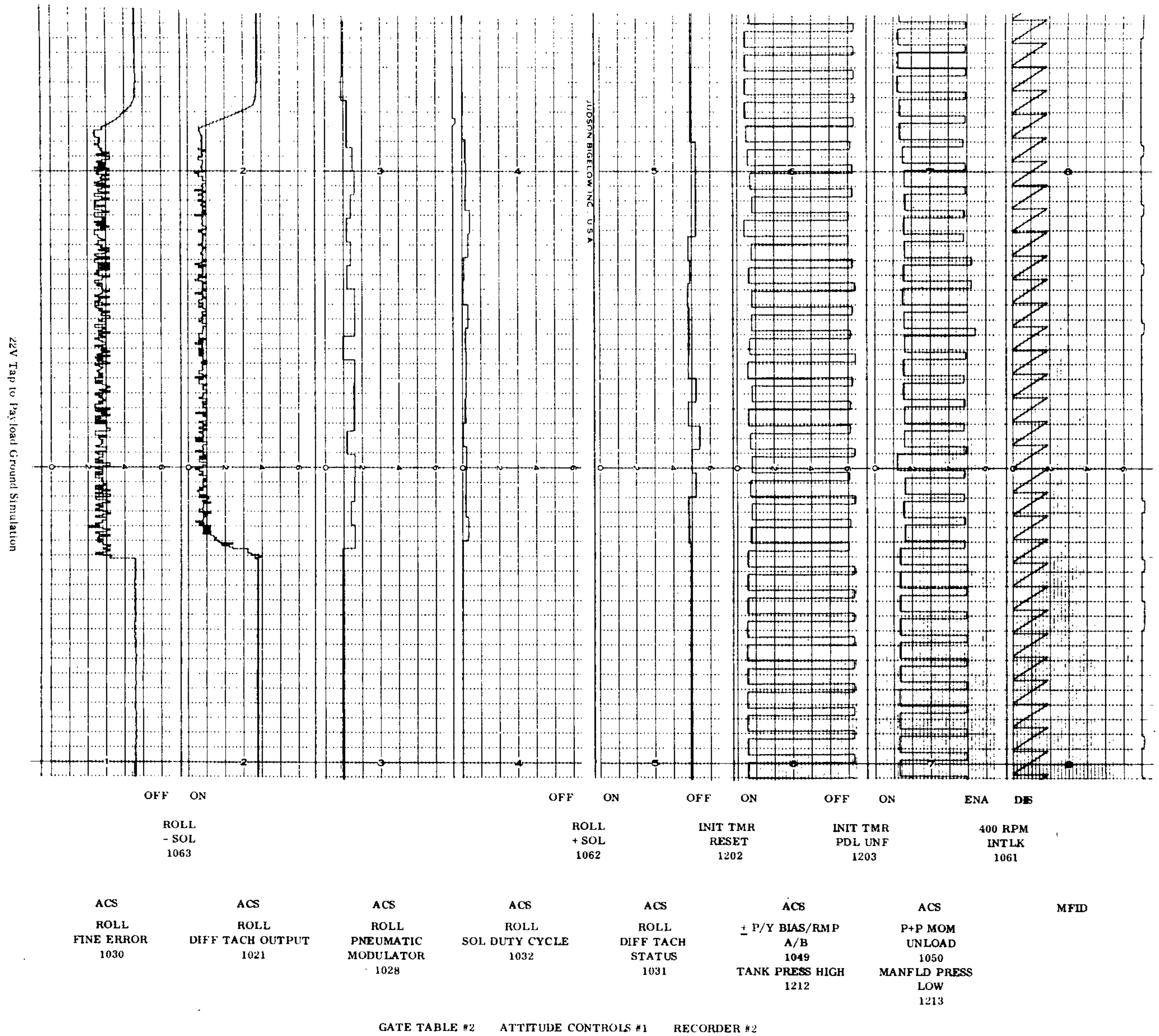


Figure 3-4. Correlation of ACS Telemetry Signatures Obtained During the Orbit 149 Anomaly and During the 22 Vdc Tap BIT Board Short Simulation (Sheet 5 of 6)

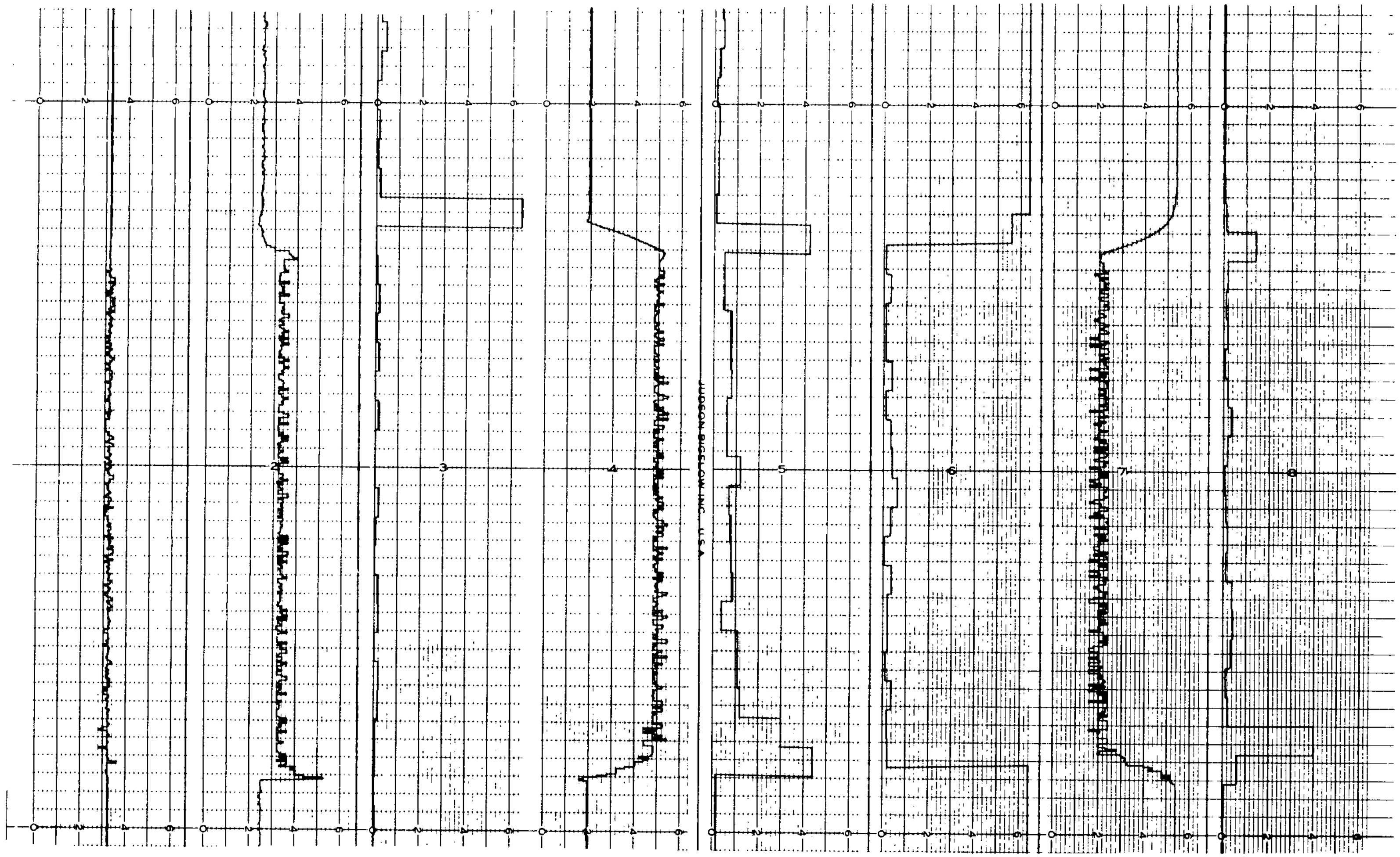
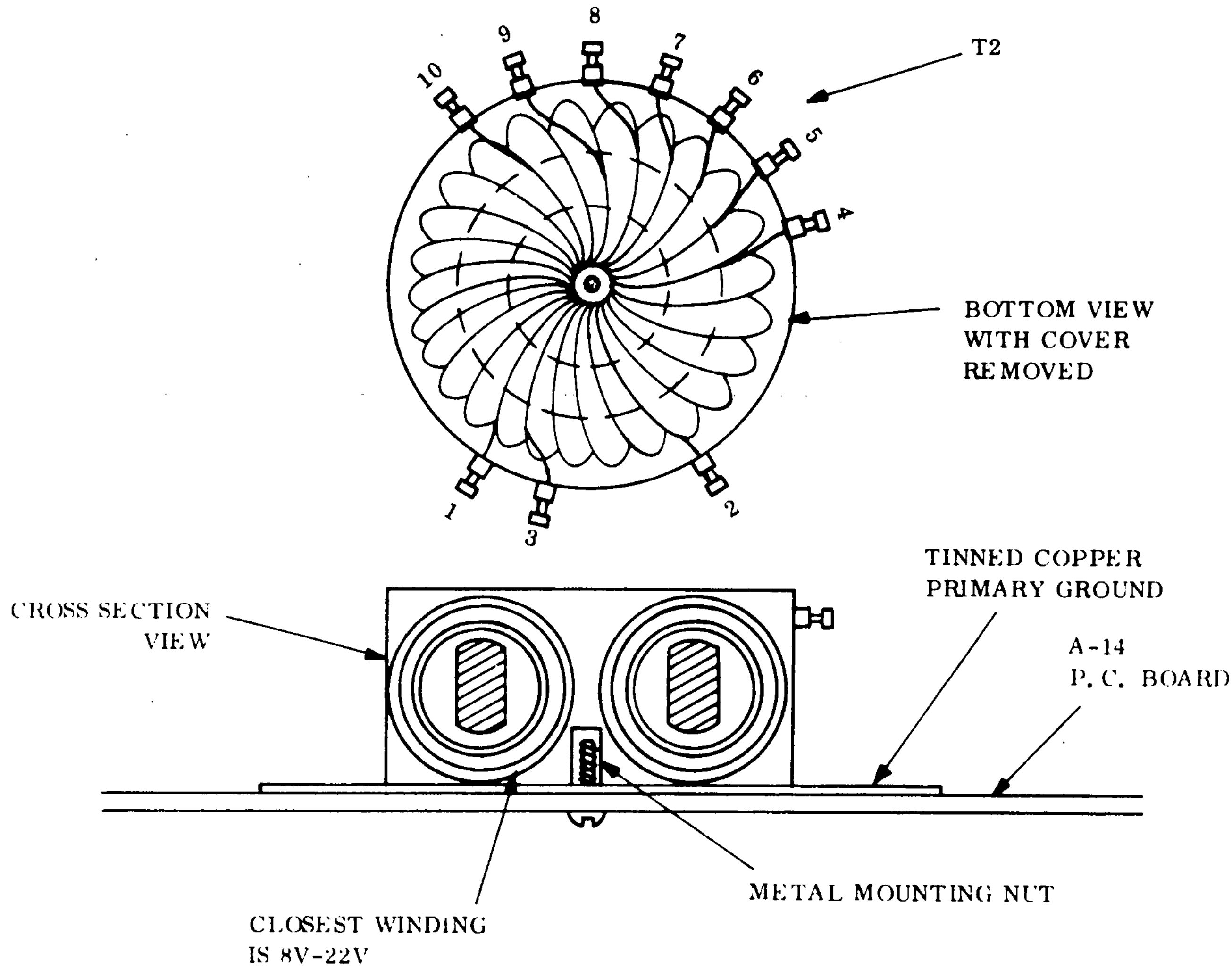


Figure 3-4. Correlation of ACS Telemetry Signatures Obtained During the Orbit 149 Anomaly and During the 22 Vdc Tap BIT Board Short Simulation (Sheet 6 of 6)



FAILURE MODE: 1. MOUNTING NUT SHORTS TO WINDING

2. MOUNTING NUT SHORTS TO TINNED COPPER GROUND PLANE

Figure 3-5. Sketch Showing Manner by Which the T-2 Transformer of WBVTR No. 2 Became Shorted

DOCUMENT NO. 72SD4259
29 DECEMBER 1972

ERTS 1 SPACECRAFT
RBV ANOMALY
BENCH TEST REPORT

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

The investigation of the ERTS 1 orbit 196 anomaly associated with the RBV Turn On was based on spacecraft telemetry data analysis and BIT component testing and system level testing.

The BIT Test Program consisted of a series of relay tests which have been covered under a separate report and the following system level tests covered in this report.

1. RBV Current Transient Test
2. Payload Bus Short Circuit Simulation
3. RBV Reactivation Simulation

The RBV current transient test was conducted using the feasibility model RBV system, which is composed of a CCC, one camera electronics and one camera sensor in conjunction with the basic S/C equipment on the BIT Board. The purpose was to determine the changes in RBV Turn On transient from nominal with the CCC input choke shorted.

The Payload Bus Short Circuit Simulation was performed using the BIT S/C power supply/PSM, harness, etc., plus the feasibility model RBV. Short circuits were momentarily placed between RBV On power and various returns in order to reproduce the telemetry symptoms obtained from flight data.

The RBV Reactivation Simulation was performed using the BIT S/C power supply and two Leach Relays which were turned on into a short circuit with the Payload Battery tap lines open. This was done several times to determine if the Leach relays could withstand a turn on into a short circuit (worst case turn on) and still function properly. The battery tap lines were kept open to limit the current to approximately 25 amps.

The results of these tests indicated the following.

1. The RBV Turn On transient with CCC input choke shorted was not large enough to account for the current drawn in flight.

2. The RBV On power shorted to chassis (only) caused similar telemetry symptoms as seen in flight data.

3. The Leach relays can withstand several turn on's into a short circuit with the battery tap lines open and still function properly. Therefore, if a short circuit exists within the RBV at reactivation, the system can be safely turned off.

SECTION 2

RBV CURRENT TRANSIENT

This test was run to determine the change in the current pulse waveform at the PSM relay that occurs when the input choke of the RBV CCC is shorted.

Figure 2-1 shows the circuit on the BIT Board used in measuring the turn-on transient.

Current measurements were made of the total RBV current at P5P03-9 through 17 with an ac probe, HP Model 1110A, and amplifier, HP Model 1111A. The RBV used was the feasibility model which has only a CCC and one camera electronics and camera sensor.

Figure 2-2 shows both the transient for RBV turn-on with the CCC input choke functional and with the CCC input choke shorted.

The magnitude of the initial spike was 26.5a in the normal case and 30a in the shorted case (a 17% increase). The duration of the spike increased to 270 microsec.

The effect on the payload regulated bus voltage is effectively the same in magnitude with the time to recover equal to 50 msec for the normal case and 55 msec for the shorted case.

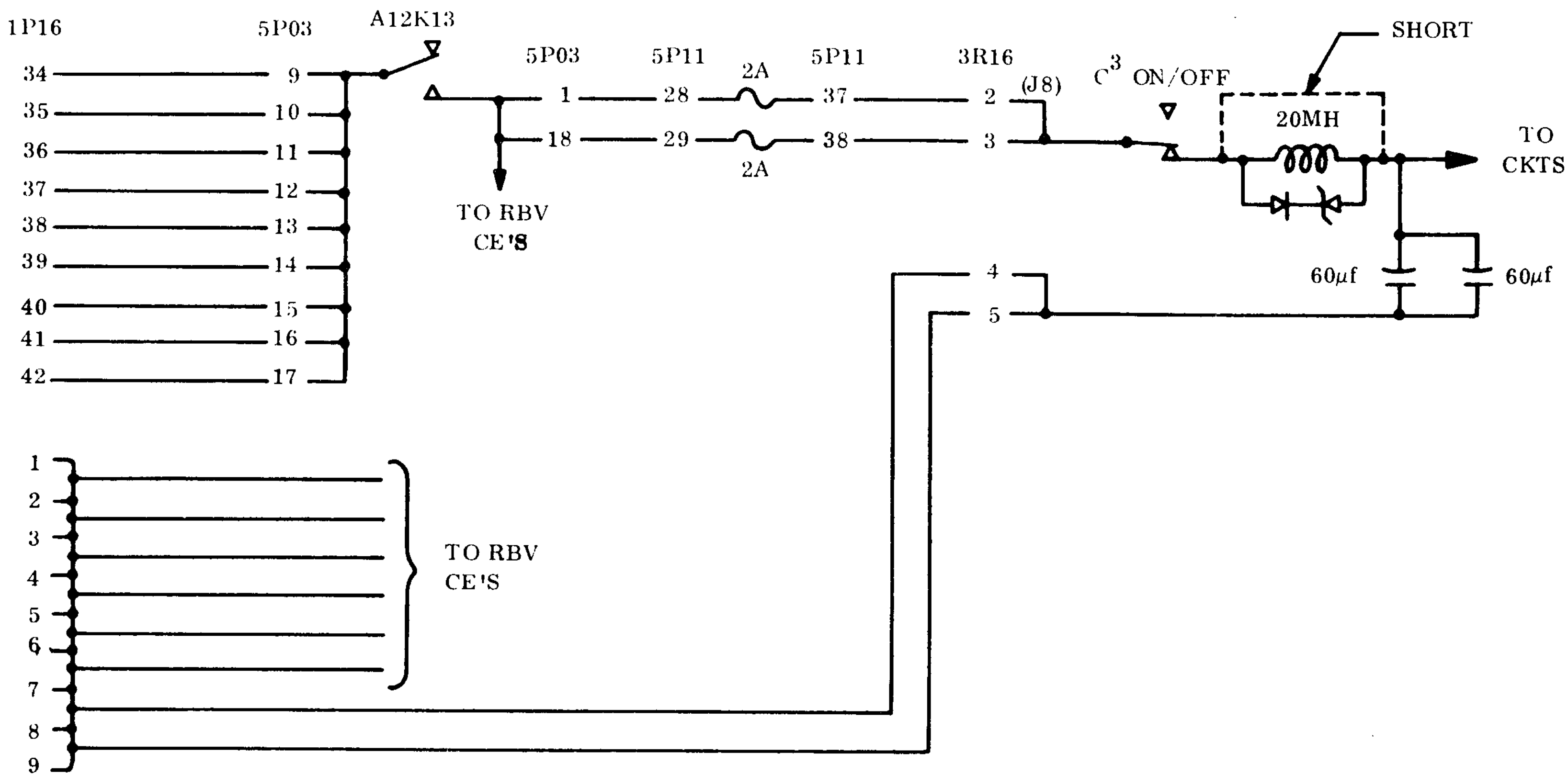
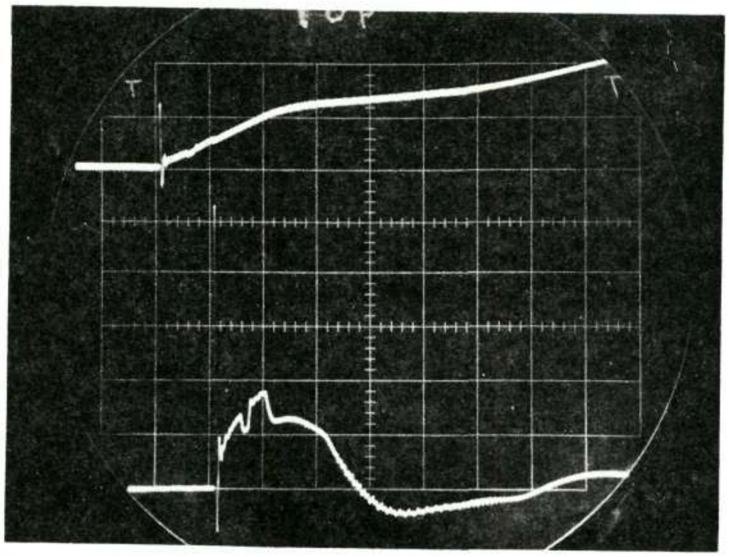
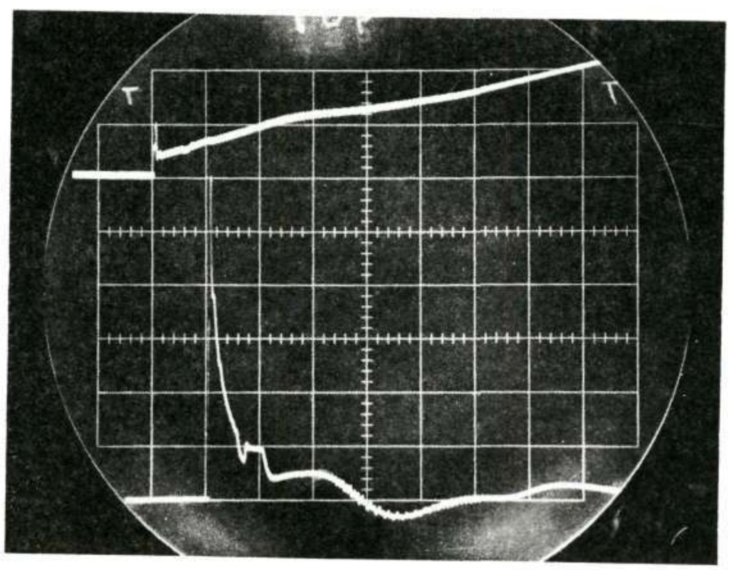


Figure 2-1. BIT Board Setup Used to Measure the RBV Turn-on Transient



a) Choke Normal



b) Choke Shorted

Upper - Payload Reg Bus Voltage - 2.5 V/CM
Lower - RBV Current - 5A/CM (AC Coupled Probe)
Hor - 0.5 MSEC/CM (Lower Trace Offset 1 CM to the Right)

Figure 2-2. Photographs Showing RBV Turn-on Transients

SECTION 3

SHORT SIMULATION

A symptom of the RBV turnon anomaly was that Telemetry referenced to the Spacecraft bus return showed a momentary shift toward zero. Simulations on the BIT system were made to duplicate the shift and to generate a calibration by which the current pulse during the anomaly could be measured.

Interrelation of the power grounding system is shown in Figure 3-1.

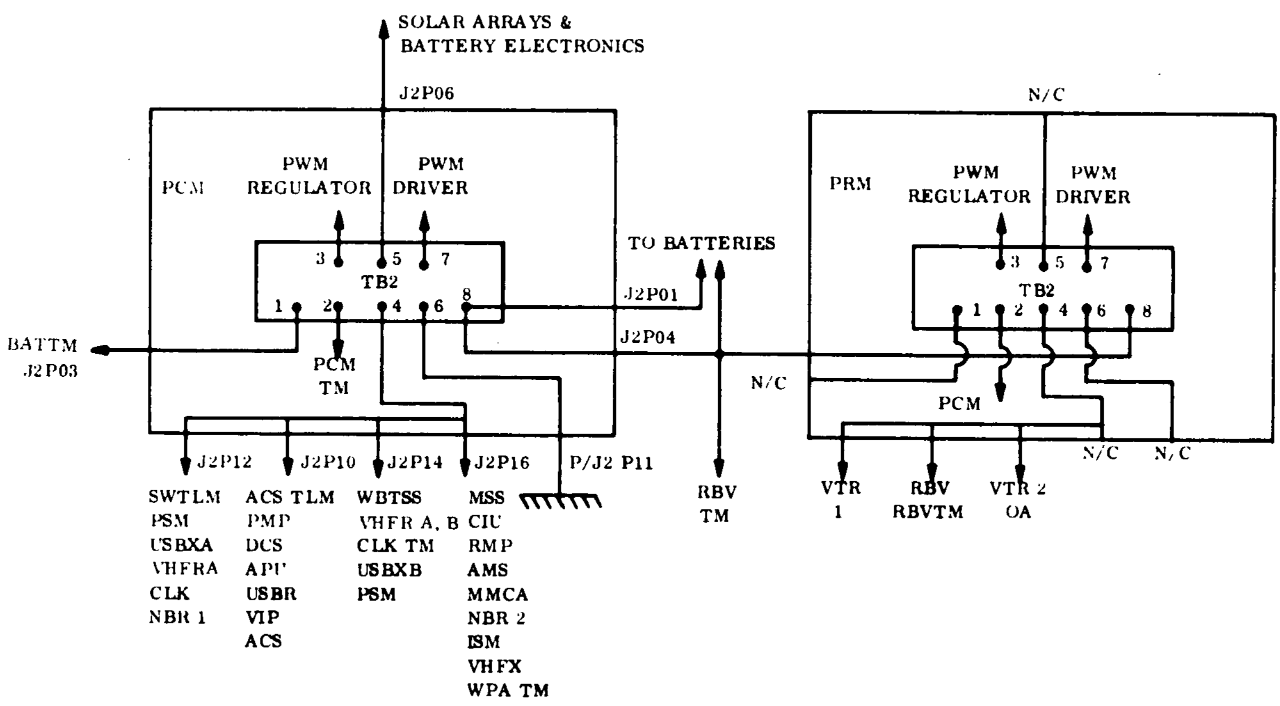
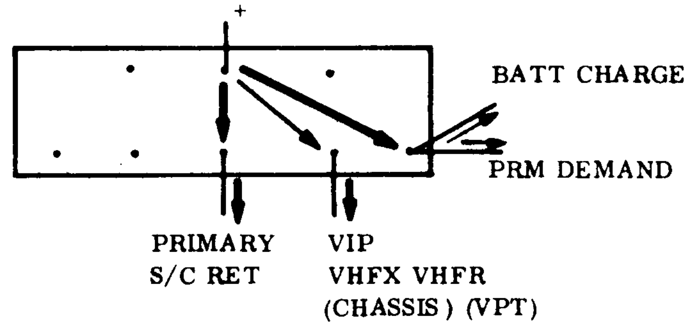
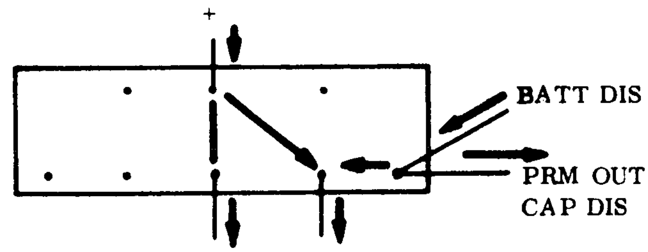


Figure 3-1. Power Return Configuration

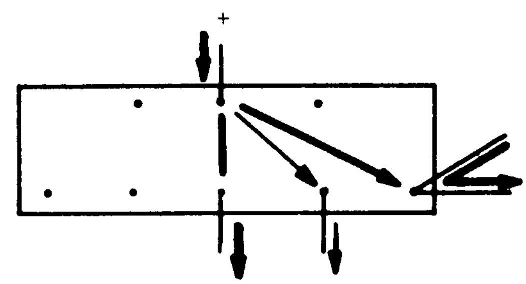
Normal current flows in the board are shown below:



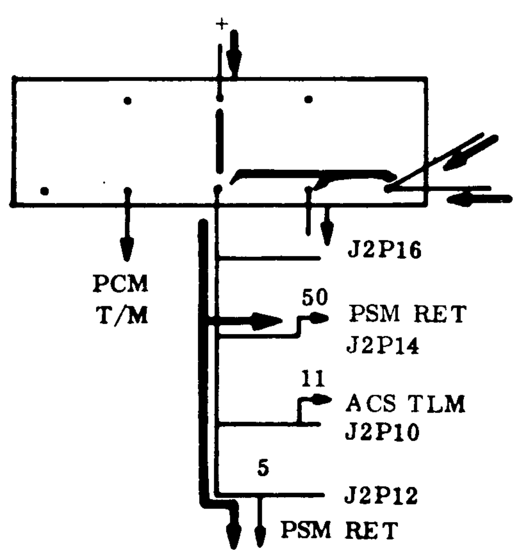
Current during short of PRM output to chassis is shown below:



Current during short of PRM output to PRM return is shown below:



Current during short of PRM output to PSM relay return is shown below:



In BIT tests the output of the RBV subsystem power relay was connected through a knife switch to ground. A one-milliohm shunt was installed in the RBV lines to the PSM. The switch was closed with RBV OFF, and was opened immediately after the RBV ON command. An oscilloscope was connected across the shunt, and photographs were made of the current pulse and bus voltage. The short was made to chassis, PSM Relay Return to the PSM, and PRM (see Figures 3-2, 3-3, and 3-4). The spikes on the current trace are believed to be oscillation of the under voltage, current limit, and duty cycle circuits. ACS telemetry showed no effect from shorts to PRM return. Shorts to PSM relay return caused an increase (more negative) in telemetry of about 0.3 V. Shorts to chassis caused a decrease (toward zero) in telemetry of about 0.4 V, as was observed in orbit.

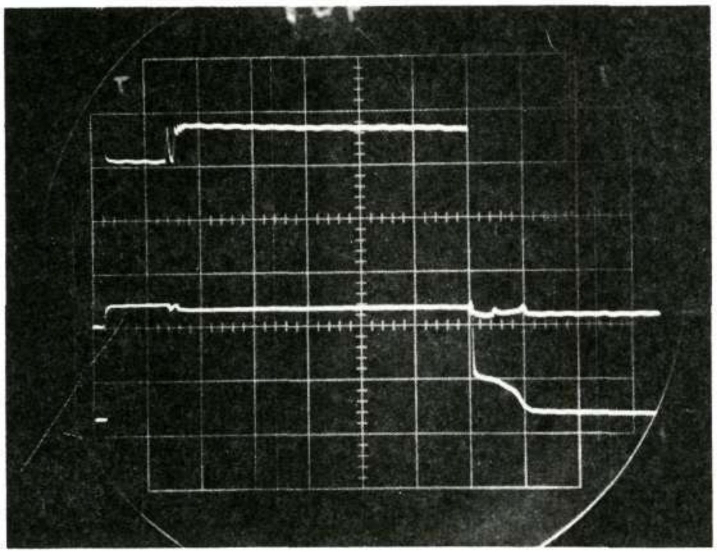
The VHF receiver has power return shorted to chassis at the secondary of its dc/dc converter. The VHF transmitter shorts power return, relay return (PSM - driven relays), and modulation input return (VIP power return) to chassis at its input. These provide stray paths between PCM ground and unipoint whose current sharing and effects allow measurement of the RBV turn on transient.

BIT shorts to chassis did not simulate the flight anomaly because of significantly different wire gauges and lengths. The primary "stray" path was through the VHF transmitter to P/J2P16 (see Figure 3-5) while the path in the spacecraft was through the VHF Receiver to P/J2P12&14. The primary fact of this test was that there was no significant difference between PCM telemetries grounded at TB2 and ACS telemetries grounded at P/J2P10. This showed there was little difference in line drops from P/J2P16 and TB2 and from P/J2P11 and TB2 (normal unipoint return).

BIT shorts were also made to PSM relay returns, which connect to P/J2P12&14, <u>same as the VHF Receiver.</u> These caused a shift of -3m V/Amp in ACS telemetry, <u>but none in PCM telemetry.</u>

In the spacecraft, a straight-line fit on the ACS telemetry (shifted during the transient) gives a value of about +0.5 V shift at the time the reg bus current indicated a shift of about +0.625 V.

This gives 0.125 V difference at 3mV/amp for 42 amperes. The resistance of chassis to PCM through the VHF Receiver is about 15mΩ, and the total PCM/Chassis resistance is between 3 and 5mΩ. This would cause between 1/3 and 1/5 of the current to go through the receiver, so the total would be between 126 and 210 amps. As a double check, 210 amps through 3 mΩ or 126 amps through 5mΩ would give 630 mV, which match the regulator bus shift.



CURRENT 25 A/ CM
SWEEP 50 ma/ CM
VOLTAGE 10 V/ CM
SCALE IN ALL PHOTOS

Figure 3-2. Short to Chassis

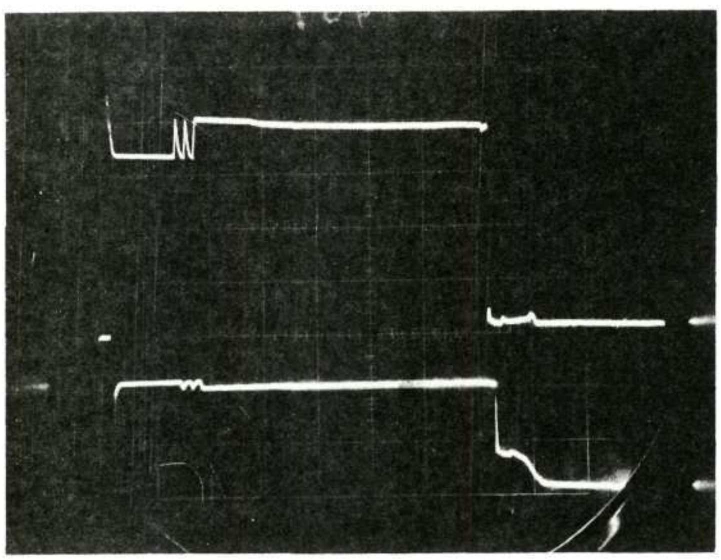


Figure 3-3. Short to RSM Relay Return

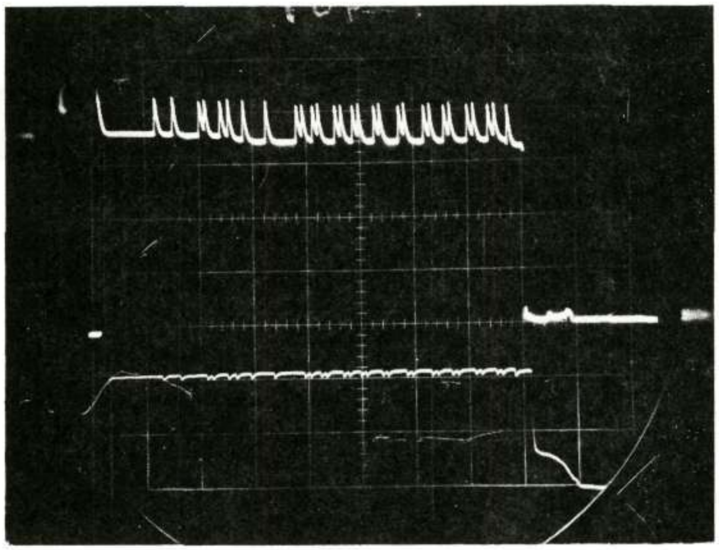


Figure 3-4. Short to Payload Return

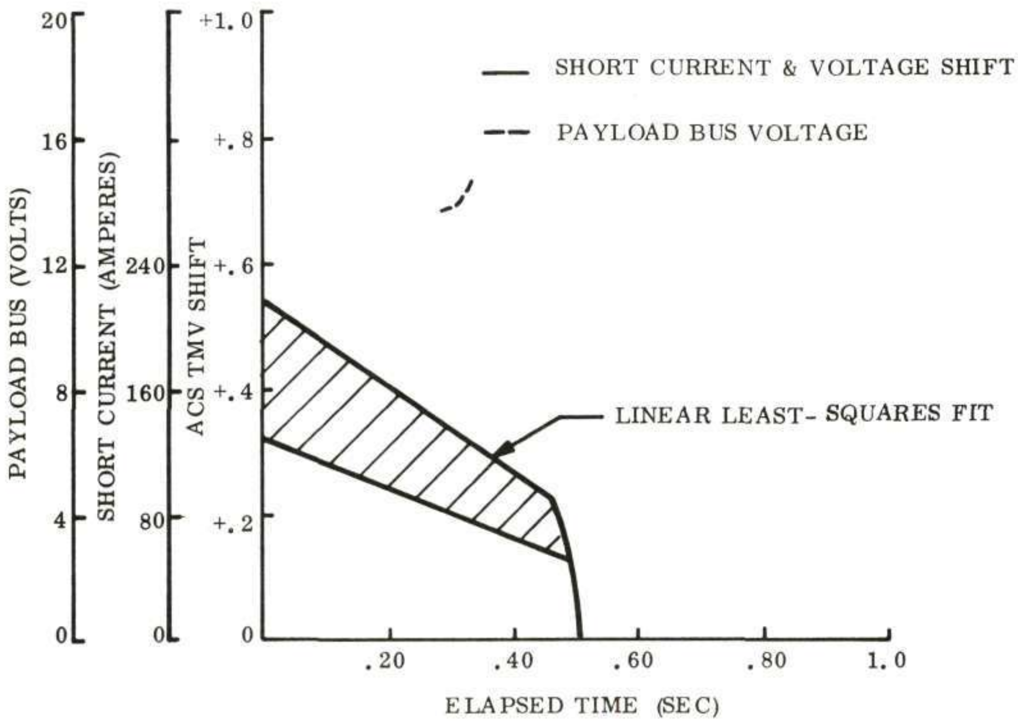


Figure 3-5. ACS Telemetry, Current and Voltage Transient at RBV Turn-on

SECTION 4

REACTIVATION SIMULATION

4.1 GENERAL

A series of tests involving PSM BR-20 relays, RBV-Leach relays and the S/C power supply were conducted at GE. The Leach relays and the S/C power supply were utilized in a test simulating the reactivation of the RBV. The purpose of the test was to determine if the Leach relays could withstand several operations of closing the S/C power supply into a short circuit with the battery taps open (see Figure 4-1). This would simulate a worst case reactivation if a short circuit existed within the RBV system. Two Leach relays were tested separately in the circuit with each contact being subjected to 10 closures into a short circuit. With the battery taps open the current was limited to approximately 20 amps supplied by the PRM. The photograph shown in Figure 4-2 represents a typical current draw through the contacts.

4.2 RESULTS AND CONCLUSIONS

Both relays operated normally throughout the test. At the conclusion of the test the relays were submitted to failure analysis and all contacts were examined with the following results.

1. L1 - Contacts bright and clear - no degradation (see Figure 4-3).
2. L2 - Small central spot of descoloration on all eight contacts. Evidence of localized surface material transfer - no welding (see Figure 4-4).

From the test with Relay L-2 (used contacts), it was concluded that if a short circuit exists internal to the RBV at the instant of reactivation (with battery taps open), the Leach relay will not be welded or permanently disabled and the RBV may be turned off.

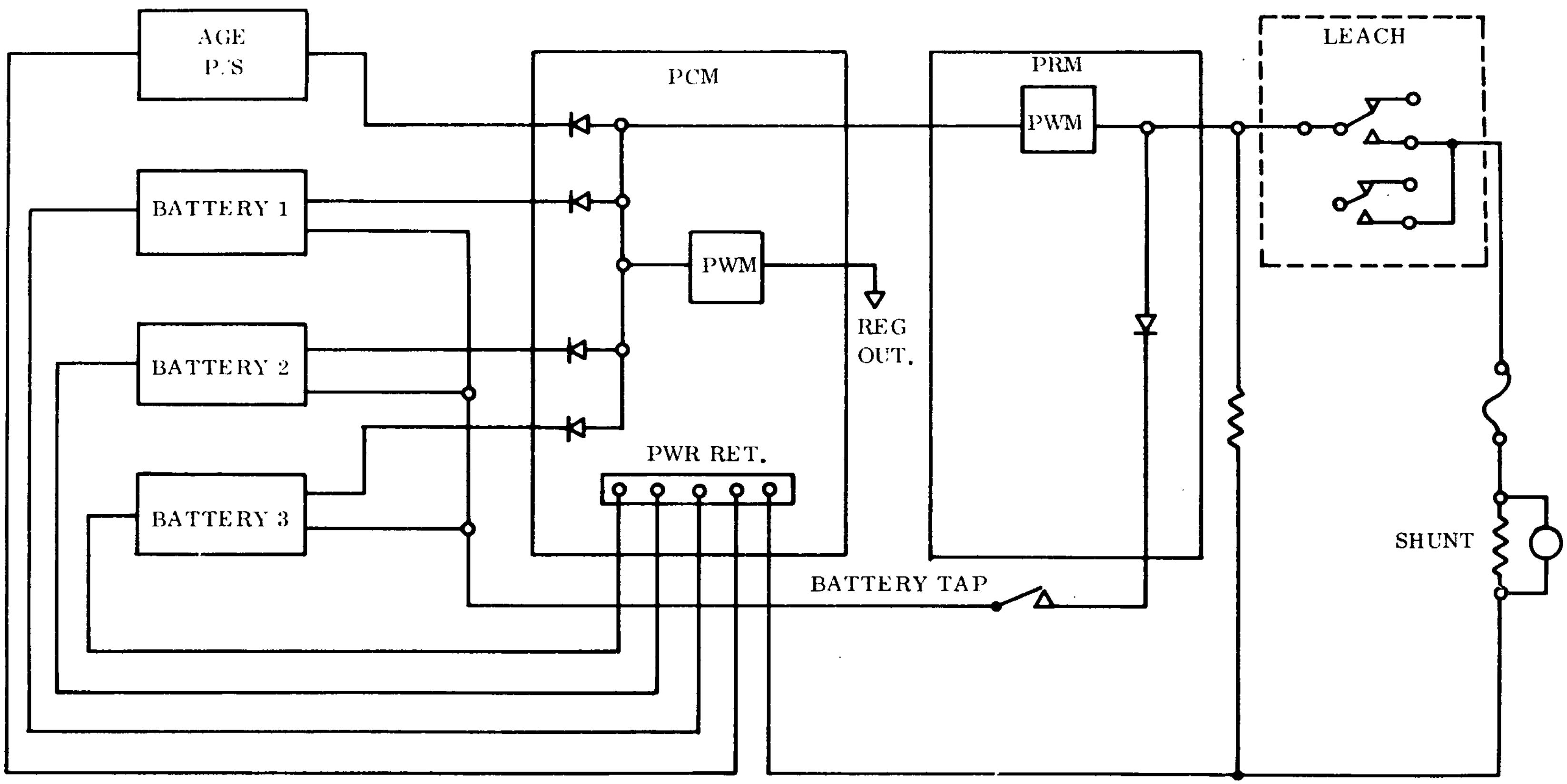


Figure 4-1. Reactivation Simulation Test Schematic

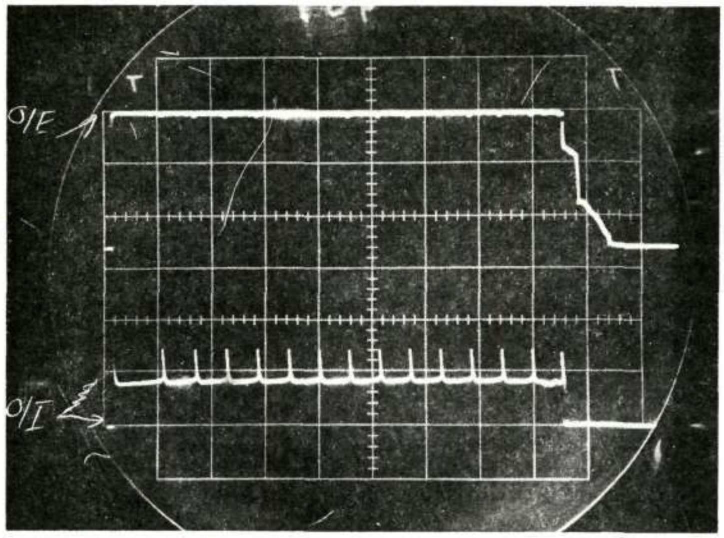


Figure 4-2. Photograph Showing Typical Current Drawn Through Contacts

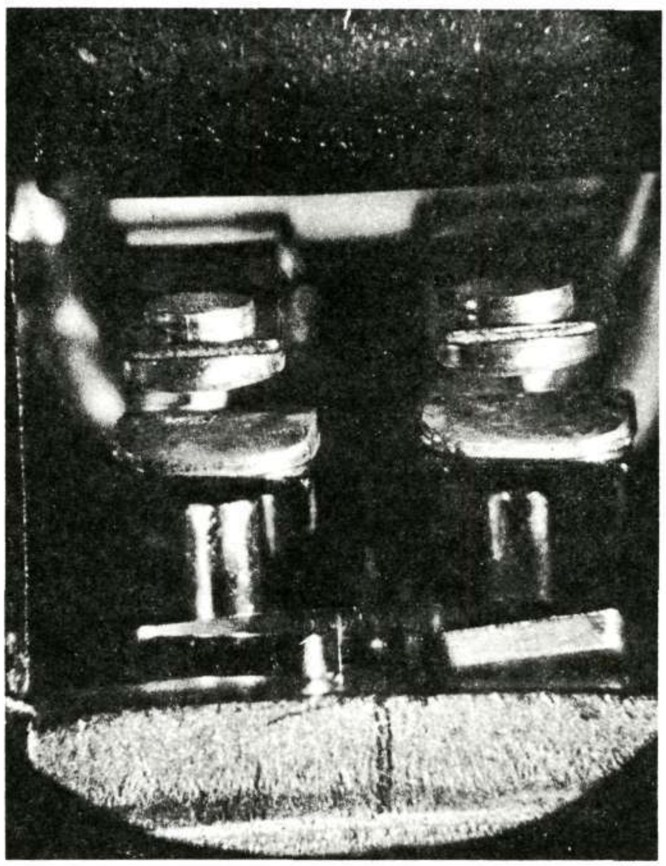


Figure 4-3. Relay L1 - Used Contacts

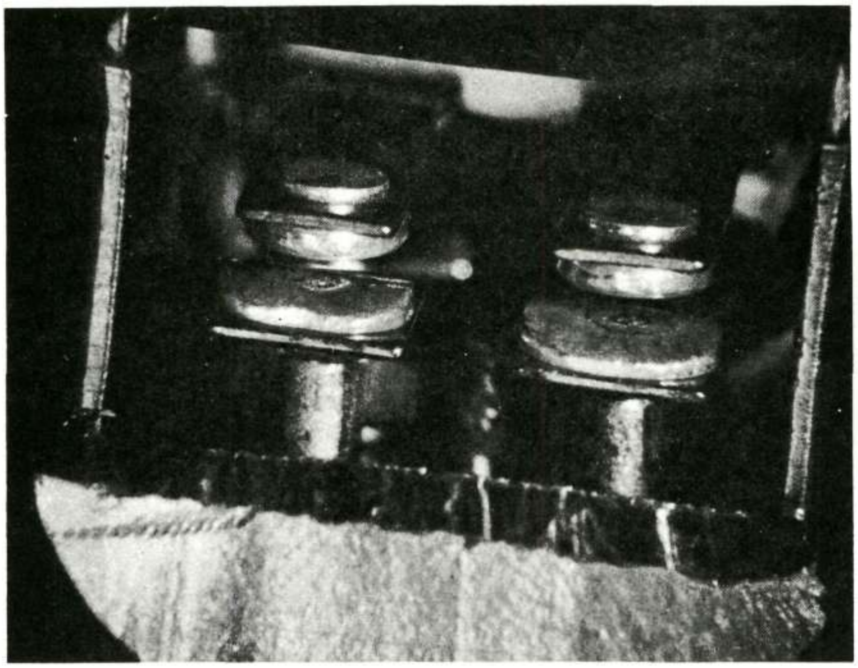


Figure 4-4. Relay L2 - Used Contacts

GENERAL ELECTRIC
MISSILE AND SPACE DIVISION
PHILADELPHIA

PROGRAM INFORMATION REQUEST / RELEASE

PIR NO.	*CLASS. LTR.	OPERATION	PROGRAM	SEQUENCE NO.	REV. LTR.
	U	1J83	NE	759	

*USE "C" FOR CLASSIFIED AND "U" FOR UNCLASSIFIED

FROM	TO
J. Becek NE Subsystem Engineer	P. Jones NE Elec. System Engineer

DATE SENT	DATE INFO. REQUIRED	PROJECT AND REQ. NO.	REFERENCE DIR. NO.
5/28/70		Nimbus E	

SUBJECT

COMMAND CLOCK COMMAND EXECUTION COUNTER UPDATING

INFORMATION REQUESTED/RELEASED

Introduction

During the course of Nimbus D integration and test, a number of command executions failed to occur. Eleven of these were considered to be related to the command subsystem. In three of these instances the command execution counter did not update, so the problem was considered to be related to the transmission link. In the remainder of the command failures, the counter did update (5 times) or its status was indeterminate (3 times). The problem was not considered serious due to its infrequent occurrence and the reason for the updates without command executions was never satisfactorily established.

Conclusions and Recommendations

A number of reasons for the counter updates were postulated, but were not able to be backed up by evidence:

1) Failure for a relay to pull in
2) Harness intermittant
3) Matrix driver failure
4) Short driving pulse
5) Improperly coded command
6) Improperly decoded command
7) Erroneous counter update.

The first four reasons were not very likely due to the random nature of the failures and the ability to successfully retransmit the same command immediately after the failure. The fifth reason implies computer program error since transmission bit errors are not likely to pass the command clock's error criteria; and a program error would be expected to show up more frequently. This left the last two reasons as the most likely possibilities. An investigation by Calcomp revealed that a timing race was present between the incoming command data and the internal command clock timing which could result in the same command being executed twice with the loss of a second realtime command. This is not considered a serious problem in either the Nimbus IV command clock or in future units since all command executions are verifiable by Digital B telemetry or status changes and a missed command can easily be re-transmitted. Therefore, no design changes are recommended.

DISTRIBUTION	PAGE NO.	RETENTION REQUIREMENTS: COPIES FOR	MASTERS FOR
	___ OF ___	☐ 1 MO.	☐ 3 MOS.
		☐ 3 MOS.	☐ 6 MOS.
		☐ 6 MOS.	☐ 12 MOS.
		☐ MOS.	☐ MOS.
		☐	☐ DO NOT DESTROY

Discussion

The command execution counter in the command clock is comprised of six flip-flops which are triggered by the trailing edge of the monostable multivibrator pulse which drives the matrix driver amplifiers. Therefore, an update of the counter indicates that a command (not necessarily the correct one) was decoded and the matrix driver amplifiers were triggered by the monostable. It does not determine whether or not a command pulse actually left the command clock.

There is a 100 kHz master clock signal in the command clock which is used for internal timing. This signal is derived from the 3.2 MHz master oscillator and is asynchronous with any incoming command data. It is used to establish a "T-counter" which consists of a series of 10-usec pulses counted from 1 to 50. When a realtime external command is received and decoded, the fiftieth (last) strobe pulse is OR'd with the T2 pulse to activate a gate (L-gate). The L-gate sets a shift control flip-flop in the comdec and matrix decoder which permits the shifting of the nine bits of command data from the comdec to a command register in the matrix decoder. The shifting takes place at a 100 kHz rate on bit times T3 through T11, when the shift control flip-flops are reset to permit no more data to shift. The L-gate also fires the monostable which turns on the MA and MB drivers selected by the data in the matrix decoder command register and creates a matrix busy term which feeds back and inhibits the L-gate and clear the comdec. The monostable pulse is nominally 40 msec wide and the drivers are gated on by the T11 term, indicating the proper data has been shifted into the command register. The trailing edge of the monostable is used to update the command execution counter.

Since the incoming data strobe and the T-counter are asynchronous, it is possible for the L-gate pulse width to vary from 0 to 10 usec. If portions of the gate derived from the 128 bps data strobe became true just as the T2 portion was preparing to go false, a very narrow pulse would result. This pulse could fire the monostable but not set the flip-flops, which require a finite time at their inputs. This would result in execution and counting of the previous command which still occupies the matrix decoder command register.

Calcomp demonstrated the above in a laboratory test using a breadboard matrix and a controlled L-gate. This test showed that pulses less than 50 nanoseconds wide would fire the monostable but not set the shift control flip-flops. The problem could be prevented by synchronizing the T2 term to the L-gate or by creating the matrix busy feedback term with the monostable firing <u>and</u> the setting of the flip-flops. Either approach would involve a design change and is not considered necessary since the problem affects only realtime commands which are monitored.

The above satisfactorily explains the problems observed during Nimbus D I&T, but leaves some questions unanswered. Since the maximum L-gate pulse width is 10 usec (governed by the T2 term) and the minimum pulse width to set the flip-flops is 0.05 usec, it appears that in a large sample, 1 out of every 200 commands should be counted but not executed. Test data showed evidence of 1 in 10,000 (estimated total). (<u>Note</u>: It can be assumed that the ratio was somewhat higher than this since many commands are sent to ensure a status which already exists and their non-execution would not have been observable). Also, the above timing problem could result in the first command of a transmitted sequence being missed and the last command of the preceding transmission (which is still in the command register) being executed. If the erroneously executed command was one that changes a normally automatic S/S status, an undesired response could result. This was never observed during test. It appears that there is still a missing variable which lowers the probability of this occurrence. It is believed that further investigation by Calcomp is warrented.

APPENDIX C

ERTS-1 DCS PLATFORM LISTS

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Distribution

DATE: December 20, 1972

FROM : J. Williamson - 430

SUBJECT: DCS PLATFORM LISTS

REFERENCE: Memo from ERTS DCS Engineer (Painter) to ERTS GDHS (Holmes), "Platform Activations", 15 December 1972.

The attached lists reflect the latest DCS Platform information which has been supplied to the GDHS (Reference).

Corrections or additions should be given to J. Padden, X2745.

James M Williamson

James M. Williamson
Assistant Operations Director
ERTS Project

CC: L. Gonzales
R. Holmes (2)
T. Winchester (4)
E. Painter
J. Boeckel
E. Szajna
E. Crump
G. Ensor
A. Finelly
R. Stonesifer
L. Smith

C-1

RUN

JMW
GSFC-430
12-20-72

ERTS DCS PLATFORMS
SORTED BY USER ID

USER ID	PRO REQ	PLATFORM OCT	DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
D002	RLH	6010	8	41-45N	71-27W	RI	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6012	10				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6021	17	44-52N	69-51W	MAIN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6042	34				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6071	57				HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6101	65				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6106	70	43-48N	70-47W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
D002	RLH	6127	87	41-46N	72-40W	CONN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6142	98	42-34N	71-47W	MASS	HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6147	103				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6170	120	45-14N	68-39W	MAIN	HYDR	11-07-72	COOPER	ARMY ENG MASS
D002	RLH	6171	121				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6201	129				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6206	134	43-45W	71-41W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
D002	RLH	6207	135	42-24N	71-13W	MASS	HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6216	142				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6220	144				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6233	155				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6242	162				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6246	166	42-15N	71-00W	MASS	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6254	172				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6271	185	47-15N	68-35W	MAIN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6272	186				HYDR	11-07-72	COOPER	ARMY ENG MASS
D002	RLH	6273	187				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6304	196	44-04N	70-12W	MAIN	HYDR	11-27-72	COOPER	ARMY-ENG-MASS
D002	RLH	6325	213				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6335	221				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6345	229				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6355	237	42-06N	72-38W	NY	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6356	238	42-15N	71-15W	MASS	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D011	LH	6074	60				HYDR	10-24-72	KEE	USN OCEANGRAPH
D011	LH	6153	107				HYDR	10-24-72	KEE	USN OCEANGRAPH
D011	LH	6336	222				HYDR	10-24-72	KEE	USN OCEANGRAPH
I015	LH	6004	4			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6013	11			MISS	HYDR	12-15-72	PREBLE	USGS-MISS
I015	LH	6017	15			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6024	20			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6025	21			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6040	32			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6051	41			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6056	46			MISS	HYDR	9-22-72	PREBLE	USGS-MISS
I015	LH	6062	50			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6075	61			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6107	71			MISS	HYDR	8-31-72	PREBLE	USGS-MISS

I015	LH	6110	72			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6122	82			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6136	94			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6143	99			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6157	111			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6166	118			MISS	HYDR	9-22-72	PREBLE	USGS-MISS
I015	LH	6202	130			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6204	132			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6212	138			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6230	152			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6241	161			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6245	165			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6251	169			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6257	175			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6263	179			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6266	182			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6301	193			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6303	195			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6307	199			MISS	HYDR	12-15-72	PREBLE	USGS-MISS
I015	LH	6327	215			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6337	223			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6347	231			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6351	233			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I023	LH	6020	16	40-30N	121-15W	CALF	GEØL	8-31-72	FRIEDMAN	USGS-WASH-DC
I023	LH	6104	68	40-30N	121-20W	CALF	GEØL	8-31-72	FRIEDMAN	USGS-WASH-DC
N024	RLH	6014	12				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6022	18				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
N024	RLH	6023	19				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
N024	RLH	6032	26				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
N024	RLH	6035	29				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6050	40				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
N024	RLH	6052	42				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6072	58				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
N024	RLH	6133	91				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6226	150				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6305	197				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
N024	RLH	6324	212				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
N024	RLH	6333	219				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
N024	RLH	6350	232				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6360	240				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6375	253				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
N024	RLH	6401	257				HYDR	7-23-72	KRIEGER	NASA-WALLØPS
I066	LH	6006	6				HYDR	8-31-72	SCHUMAN	USGS-PHØENIX
I066	LH	6016	14				HYDR	7-23-72	SCHUMAN	USGS-PHØENIX
I066	LH	6151	105				HYDR	8-31-72	SCHUMAN	USGS-PHØENIX
I066	LH	6165	117				HYDR	9-22-72	SCHUMAN	USGS-PHØENIX
I066	LH	6177	127				HYDR	8-31-72	SCHUMAN	USGS-PHØENIX
I066	LH	6225	149				HYDR	9-22-72	SCHUMAN	USGS-PHØENIX
I066	LH	6261	177	34-36N	111-51W	ARIZ	HYDR	8-31-72	SCHUMAN	USGS-PHØENIX
100D	LH	6007	7				HMET	9-22-72	HØFFER	CØLØRADØ UNIV
100D	LH	6054	44				HMET	9-22-72	HØFFER	CØLØRADØ UNIV
102D	L	6155	109			ØHIØ		10-24-72	SWEET	BATTELLE LABS

103D	LH	6047	39			ARIZ		10-24-72	HENDRIC<SON	ARIZ UNIV
103D	LH	6167	119			ARIZ		10-24-72	HENDRIC<SON	ARIZ UNIV
103D	LH	6351	241			ARIZ		10-24-72	HENDRIC<SON	ARIZ UNIV
104D	LH	6140	96	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
104D	LH	6175	125	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
104D	LH	6317	207	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
105D	L	6060	48				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6061	49				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6105	69				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6120	80				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6156	110				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6164	116				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6224	148				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6265	181				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6323	211				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6346	230				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6357	239				HYDR	10-24-72	HENRY	ALA UNIV
106D		7701	961	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
106D	LB	7707	967	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
I340	RLH	6030	24	41-02N	75-01W	PENN	HYDR	7-23-72	PAULSON	USGS-HARISBG
I340	RLH	6046	38				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6067	55				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6114	76				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6115	77	39-58N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6116	78	41-16N	74-47W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6124	84	39-30N	75-34W	PENN	HYDR	7-23-72	PAULSON	USGS-HARISBG
I340	RLH	6215	141				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6223	147	41-00N	75-05W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6227	151				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6275	189				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6277	191				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6306	198	40-41N	75-12W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6312	202				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6322	210				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6331	217	40-42N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6332	218	39-41N	75-31W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6341	225				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6343	227	40-04N	74-51W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6344	228	39-50N	75-22N	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6367	247				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6371	249				HYDR	8-31-72	PAULSON	USGS-HARISBG
N347	L	6044	36				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6045	37				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6077	63				HYDR	7-23-72	ERB	NASA-MSC
N347	L	6112	74				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6125	85				HYDR	7-23-72	ERB	NASA-MSC
N347	L	6152	106				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6211	137				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6234	156				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6235	157				HYDR	8-31-72	ERB	NASA-MSC
N347	L	6244	164				HYDR	8-31-72	ERB	NASA-MSC
F360	RLB	6102	66				HMET	8-31-72	CAMPBELL	-ONTARIO

F360	RLO	6126	86	50-38N	117-03W	BC	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6137	95				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6150	104	59-23N	108-53W	SASK	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6232	154				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6260	176	61-52N	121-21W	NWT	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6353	235				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6354	236	51-01N	118-05W	BC	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLO	6356	246				HMET	8-31-72	CAMPBELL	-ONTARIO
F368	RL	6270	184	46-52N	71-39W	QUEB	HMET	8-31-72	PERRIER	RESOURCES-QUE
I378	L	6144	100				HYDR	11-08-72	CAMERON	USGS-LOUISANA
I378	L	6237	159				HYDR	11-08-72	CAMERON	USGS-LOUISANA
I380	L	6063	51	42-40N	70-54W	MASS		11-27-72	KNOX	USGS-BOSTON
I381	L	6037	31				HYDR	10-24-72	BARNES	USGS-NASHVILE
I381	L	6203	131				HYDR	10-24-72	BARNES	USGS-NASHVILE
I382	L	6264	180					10-24-72	KAPUTSKA	USGS-OREGON
I384	LH	6005	5				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6011	9				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6034	28				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6036	30				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6043	35				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6057	47				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6066	54				GEOL	7-23-72	EATON	USGS-CALIF
I384	LH	6103	67				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6117	79				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6132	90				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6154	105				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6162	114				GEOL	7-23-72	EATON	USGS-CALIF
I384	LH	6163	115				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6176	126				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6213	139				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6240	160				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6247	167				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6262	178				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6274	188				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6276	190				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6311	201				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6315	205				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6320	208				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6334	220				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6342	226				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6365	245				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6370	248				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6372	250				GEOL	10-24-72	EATON	USGS-CALIF
I390	L	6402	258				HYDR	10-24-72	BEAMER	USGS-HARISBG
I414	RLH	6031	25			FLA	HYDR	7-23-72	HIGER	USGS-MIAMI
I414	RLH	6033	27			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6055	45			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6070	56			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6121	81			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6141	97			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI

I414	RLH	6214	140			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6236	158			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6250	168			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6252	170			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6256	174			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6313	203			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6321	209			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
I414	RLH	6362	242			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
I414	RLH	6363	243			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
F461	RLO	6210	136				HMET	8-31-72	KRUUS	FISH-OTTAWA
F501	RL	6222	146				HMET	8-31-72	ZUBRYCKY	FISH-OTTAWA
F502	RLO	6135	93	43-17N	79-08W	ONT	HMET	8-31-72	MACPHAIL	IN-WATER-ONT
F503	RL	6330	216				HMET	8-31-72	VOCKEROTH	ATMOS-ONT
P550	LO	7000	512	40-05N	75-23W	PENN	TEST	7-23-72	WOOD	GE-VF
P550		7001	513	40-05N	75-23W	PENN	TEST	7-23-72	WOOD	GE-VF
P568	L	6073	59			VIRG		10-24-72	GREELEY	MITRE CORP-VA
P568	L	6373	251			VIRG		10-24-72	GREELEY	MITRE CORP-VA
U661	LH	6131	89			KANS		10-24-72	KANEMASU	KSU-KANSAS
U661	LH	6310	200			KANS		10-24-72	KANEMASU	KSU-KANSAS

STOP 0

RUN

JMW
GSFC-430
12-20-72

ERTS DCS PLATFØRMS
SØRTED BY DCP ID

PLATFØRM ØCT	PLATFØRM DEC	USER ID	PRØ REQ	LAT	LØNG	LØC	STUDY	VALID	USER	AFFILIATIØN
6000	0									
6001	1									
6002	2									
6003	3									
6004	4	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6005	5	I384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6006	6	I066	LH				HYDR	8-31-72	SCHUMAN	USGS-PHØENIX
6007	7	I00D	LH				HMET	9-22-72	HØFFER	CØLØRADØ UNIV
6010	8	D002	RLH	41-45N	71-27W	RI	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6011	9	I384	LH				GEØL	9-22-72	EATØN	USGS-CALIF
6012	10	D002	RLH				HYDR	11-27-72	CØØPER	ARMY ENG MASS
6013	11	I015	LH			MISS	HYDR	12-15-72	PREBLE	USGS-MISS
6014	12	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6015	13									
6016	14	I066	LH				HYDR	7-23-72	SCHUMAN	USGS-PHØENIX
6017	15	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6020	16	I023	LH	40-30N	121-15W	CALF	GEØL	8-31-72	FRIEDMAN	USGS-WASH-DC
6021	17	D002	RLH	44-52N	69-51W	MAIN	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6022	18	N024	RLH				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
6023	19	N024	RLH				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
6024	20	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6025	21	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6026	22									
6027	23									
6030	24	I340	RLH	41-02N	75-01W	PENN	HYDR	7-23-72	PAULSØN	USGS-HARISBG
6031	25	I414	RLH			FLA	HYDR	7-23-72	HIGER	USGS-MIAMI
6032	26	N024	RLH				HYDR	8-31-72	KRIEGER	NASA-WALLØPS
6033	27	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6034	28	I384	LH				GEØL	9-22-72	EATØN	USGS-CALIF
6035	29	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6036	30	I384	LH				GEØL	10-24-72	EATØN	USGS-CALIF
6037	31	I381	L				HYDR	10-24-72	BARNES	USGS-NASHVILE
6040	32	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6041	33									
6042	34	D002	RLH				HYDR	11-27-72	CØØPER	ARMY ENG MASS
6043	35	I384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6044	36	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6045	37	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6046	38	I340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6047	39	I030	LH			ARIZ		10-24-72	HENDRICKSØN	ARIZ UNIV
6050	40	N024	RLH				HYDR	11-08-72	KRIEGER	NASA-WALLØPS
6051	41	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6052	42	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6053	43									
6054	44	I00D	LH				HMET	9-22-72	HØFFER	CØLØRADØ UNIV
6055	45	I414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI

6056	46	I015	LH			MISS	HYDR	9-22-72	PREBLE	USGS-MISS
6057	47	I384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6060	48	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6061	49	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6062	50	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6063	51	I380	L	42-40N	70-54W	MASS		11-27-72	KNOX	USGS-BOSTON
6064	52									
6065	53									
6066	54	I384	LH				GEOL	7-23-72	EATON	USGS-CALIF
6067	55	I340	RLH				HYDR	8-31-72	PAULSON	USGS-HARISBG
6070	56	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6071	57	D002	RLH				HYDR	8-31-72	COOPER	ARMY ENG-MASS
6072	58	N024	RLH				HYDR	8-31-72	KRIEGER	NASA-WALLOPS
6073	59	P568	L			VIRG		10-24-72	GREELEY	MITRE CORP-VA
6074	60	U011	LH				HYDR	10-24-72	KEE	USN OCEANGRAPH
6075	61	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6076	62									
6077	63	N347	L				HYDR	7-23-72	ERB	NASA-MSC
6100	64									
6101	65	D002	RLH				HYDR	7-23-72	COOPER	ARMY ENG-MASS
6102	66	F360	RLO				HMET	8-31-72	CAMPBELL	-ONTARIO
6103	67	I384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6104	68	I023	LH	40-30N	121-20W	CALF	GEOL	8-31-72	FRIEDMAN	USGS-WASH-DC
6105	69	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6106	70	D002	RLH	43-48N	70-47W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
6107	71	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6110	72	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6111	73									
6112	74	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6113	75									
6114	76	I340	RLH				HYDR	8-31-72	PAULSON	USGS-HARISBG
6115	77	I340	RLH	39-58N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6116	78	I340	RLH	41-16N	74-47W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6117	79	I384	LH				GEOL	10-24-72	EATON	USGS-CALIF
6120	80	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6121	81	I414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6122	82	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6123	83									
6124	84	I340	RLH	39-30N	75-34W	PENN	HYDR	7-23-72	PAULSON	USGS-HARISBG
6125	85	N347	L				HYDR	7-23-72	ERB	NASA-MSC
6126	86	F360	RLO	50-38N	117-03W	BC	HMET	8-31-72	CAMPBELL	-ONTARIO
6127	87	D002	RLH	41-46N	72-40W	CONN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
6130	88									
6131	89	U661	LH			KANS		10-24-72	KANEMASU	KSU-KANSAS
6132	90	I384	LH				GEOL	10-24-72	EATON	USGS-CALIF
6133	91	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLOPS
6134	92									
6135	93	F502	RLO	43-17N	79-08W	ONT	HMET	8-31-72	MACPHAIL	IN WATER-ONT
6136	94	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6137	95	F360	RLO				HMET	8-31-72	CAMPBELL	-ONTARIO
6140	96	104D	LH	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
6141	97	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6142	98	D002	RLH	42-34N	71-47W	MASS	HYDR	11-07-72	COOPER	ARMY ENG-MASS
6143	99	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6144	100	I378	L				HYDR	11-08-72	CAMERON	USGS-LOUISANA
6145	101									
6146	102									
6147	103	D002	RLH				HYDR	7-23-72	COOPER	ARMY ENG-MASS

6150	104	F360	RLO	59-23N	108-53W	SASK	HMET	8-31-72	CAMPBELL	-ONTARIO
6151	105	1066	LH				HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
6152	106	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6153	107	0011	LH				HYDR	10-24-72	KEE	USN OCEANGRAPH
6154	108	1384	LH				GEOL	9-22-72	EATON	USGS-CALIF
6155	109	102D	L			OHIO		10-24-72	SWEET	BATTELLE LABS
6156	110	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6157	111	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6160	112									
6161	113									
6162	114	1384	LH				GEOL	7-23-72	EATON	USGS-CALIF
6163	115	1384	LH				GEOL	9-22-72	EATON	USGS-CALIF
6164	116	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6165	117	1066	LH				HYDR	9-22-72	SCHUMAN	USGS-PHOENIX
6166	118	1015	LH			MISS	HYDR	9-22-72	PREBLE	USGS-MISS
6167	119	103D	LH			ARIZ		10-24-72	HENDRICKSON	ARIZ UNIV
6170	120	D002	RLH	45-14N	68-39W	MAIN	HYDR	11-07-72	COOPER	ARMY ENG MASS
6171	121	D002	RLH				HYDR	11-27-72	COOPER	ARMY ENG 4ASS
6172	122									
6173	123									
6174	124									
6175	125	104D	LH	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
6176	126	1384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6177	127	1066	LH				HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
6200	128									
6201	129	D002	RLH				HYDR	11-07-72	COOPER	ARMY ENG-MASS
6202	130	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6203	131	1381	L				HYDR	10-24-72	BARNES	USGS-NASHVILE
6204	132	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6205	133									
6206	134	D002	RLH	43-45W	71-41W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
6207	135	D002	RLH	42-24N	71-13W	MASS	HYDR	7-23-72	COOPER	ARMY ENG-MASS
6210	136	F461	RLO				HMET	8-31-72	KRUUS	FISH-OTTAWA
6211	137	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6212	138	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6213	139	1384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6214	140	1414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6215	141	1340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6216	142	D002	RLH				HYDR	11-27-72	COOPER	ARMY ENG MASS
6217	143									
6220	144	D002	RLH				HYDR	7-23-72	COOPER	ARMY ENG-MASS
6221	145	N024	RLH				HYDR	7-23-72	KRIEGER	NASA-WALLOPS
6222	146	F501	RL				HMET	8-31-72	ZUBRYCKY	FISH-OTTAWA
6223	147	1340	RLH	41-00N	75-05W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6224	148	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6225	149	1066	LH				HYDR	9-22-72	SCHUMAN	USGS-PHOENIX
6226	150	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLOPS
6227	151	1340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6230	152	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6231	153									
6232	154	F360	RLO				HMET	8-31-72	CAMPBELL	-ONTARIO
6233	155	D002	RLH				HYDR	11-07-72	COOPER	ARMY ENG-MASS
6234	156	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6235	157	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6236	158	1414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6237	159	1378	L				HYDR	11-08-72	CAMERON	USGS-LOUISANA
6240	160	1384	LH				GEOL	10-24-72	EATON	USGS-CALIF
6241	161	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS

6242	162	D002	RLH				HYDR	11-27-72	COOPER	ARMY ENG MASS
6243	163									
6244	164	N347	L				HYDR	8-31-72	ERB	NASA-MSC
6245	165	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6246	166	D002	RLH	42-15N	71-00W	MASS	HYDR	8-31-72	COOPER	ARMY ENG-MASS
6247	167	I384	LH				GEOL	9-22-72	EATON	USGS-CALIF
6250	168	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6251	169	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6252	170	I414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6253	171									
6254	172	D002	RLH				HYDR	11-27-72	COOPER	ARMY ENG MASS
6255	173									
6256	174	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6257	175	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6260	176	F360	RLB	61-52N	121-21W	NWT	HMET	8-31-72	CAMPBELL	-ONTARIO
6261	177	I066	LH	34-36N	111-51W	ARIZ	HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
6262	178	I384	LH				GEOL	9-22-72	EATON	USGS-CALIF
6263	179	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6264	180	I382	L					10-24-72	KAPUTSKA	USGS-OREGON
6265	181	I050	L				HYDR	10-24-72	HENRY	ALA UNIV
6266	182	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6267	183									
6270	184	F368	RL	46-52N	71-39W	QUEB	HMET	8-31-72	PERRIER	RESOURCES-QUE
6271	185	D002	RLH	47-15N	68-35W	MAIN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
6272	186	D002	RLH				HYDR	11-07-72	COOPER	ARMY ENG MASS
6273	187	D002	RLH				HYDR	11-07-72	COOPER	ARMY ENG-MASS
6274	188	I384	LH				GEOL	10-24-72	EATON	USGS-CALIF
6275	189	I340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6276	190	I384	LH				GEOL	9-22-72	EATON	USGS-CALIF
6277	191	I340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6300	192									
6301	193	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6302	194									
6303	195	I015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6304	196	D002	RLH	44-04N	70-12W	MAIN	HYDR	11-27-72	COOPER	ARMY-ENG-MASS
6305	197	N024	RLH				HYDR	8-31-72	KRIEGER	NASA-WALLOPS
6306	198	I340	RLH	40-41N	75-12W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6307	199	I015	LH			MISS	HYDR	12-15-72	PREBLE	USGS-MISS
6310	200	U661	LH			KANS		10-24-72	KANEMASU	KSU-KANSAS
6311	201	I384	LH				GEOL	10-24-72	EATON	USGS-CALIF
6312	202	I340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6313	203	I414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6314	204									
6315	205	I384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6316	206									
6317	207	I040	LH	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
6320	208	I384	LH				GEOL	8-31-72	EATON	USGS-CALIF
6321	209	I414	RLH			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
6322	210	I340	RLH				HYDR	10-24-72	PAULSON	USGS-HARISBG
6323	211	I050	L				HYDR	10-24-72	HENRY	ALA UNIV
6324	212	N024	RLH				HYDR	11-08-72	KRIEGER	NASA-WALLOPS
6325	213	D002	RLH				HYDR	11-27-72	COOPER	ARMY ENG MASS
6326	214									
6327	215	I015	LH			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
6330	216	F503	RL				HMET	8-31-72	VOCKEROTH	ATMOS-ONT
6331	217	I340	RLH	40-42N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6332	218	I340	RLH	39-41N	75-31W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
6333	219	N024	RLH				HYDR	11-08-72	KRIEGER	NASA-WALLOPS

6334	220	1384	LH				GEØL	9-22-72	EATØN	USGS-CALIF
6335	221	D002	RLH				HYDR	11-07-72	CØØPER	ARMY ENG-MASS
6336	222	D011	LH				HYDR	10-24-72	KEE	USN ØCEANGRAPH
6337	223	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6340	224									
6341	225	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6342	226	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6343	227	1340	RLH	40-04N	74-51W	PENN	HYDR	8-31-72	PAULSØN	USGS-HARISBG
6344	228	1340	RLH	39-50N	75-22N	PENN	HYDR	8-31-72	PAULSØN	USGS-HARISBG
6345	229	D002	RLH				HYDR	11-27-72	CØØPER	ARMY ENG MASS
6346	230	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6347	231	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6350	232	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6351	233	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6352	234									
6353	235	F360	RLØ				HMET	8-31-72	CAMPBELL	-ØNTARIØ
6354	236	F360	RLØ	51-01N	118-05W	BC	HMET	8-31-72	CAMPBELL	-ØNTARIØ
6355	237	D002	RLH	42-06N	72-38W	NY	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6356	238	D002	RLH	42-15N	71-15W	MASS	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6357	239	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6360	240	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6361	241	103D	LH			ARIZ		10-24-72	HENDRICKSØN	ARIZ UNIV
6362	242	1414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6363	243	1414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6364	244									
6365	245	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6366	246	F360	RLØ				HMET	8-31-72	CAMPBELL	-ØNTARIØ
6367	247	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6370	248	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6371	249	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6372	250	1384	LH				GEØL	10-24-72	EATØN	USGS-CALIF
6373	251	P568	L			VIRG		10-24-72	GREELEY	MITRE CØRP-VA
6374	252									
6375	253	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6376	254									
6377	255									
6400	256									
6401	257	N024	RLH				HYDR	7-23-72	KRIEGER	NASA-WALLØPS
6402	258	1390	L				HYDR	10-24-72	BEAMER	USGS-HARISBG
6403	259									
6404	260									
6405	261									
6406	262									
6407	263									
7000	512	P550	LØ	40-05N	75-23W	PENN	TEST	7-23-72	WØØD	GE-VF
7001	513	P550		40-05N	75-23W	PENN	TEST	7-23-72	WØØD	GE-VF
7701	961	106D		38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
7707	967	106D	LØ	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC

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6334	220	1384	LH				GEØL	9-22-72	EATØN	USGS-CALIF
6335	221	D002	RLH				HYDR	11-07-72	CØØPER	ARMY ENG-MASS
6336	222	D011	LH				HYDR	10-24-72	KEE	USN ØCEANGRAPH
6337	223	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6340	224									
6341	225	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6342	226	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6343	227	1340	RLH	40-04N	74-51W	PENN	HYDR	8-31-72	PAULSØN	USGS-HARISBG
6344	228	1340	RLH	39-50N	75-22N	PENN	HYDR	8-31-72	PAULSØN	USGS-HARISBG
6345	229	D002	RLH				HYDR	11-27-72	CØØPER	ARMY ENG MASS
6346	230	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6347	231	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6350	232	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6351	233	1015	LH			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
6352	234									
6353	235	F360	RLØ				HMET	8-31-72	CAMPBELL	-ØNTARIØ
6354	236	F360	RLØ	51-01N	118-05W	BC	HMET	8-31-72	CAMPBELL	-ØNTARIØ
6355	237	D002	RLH	42-06N	72-38W	NY	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6356	238	D002	RLH	42-15N	71-15W	MASS	HYDR	8-31-72	CØØPER	ARMY ENG-MASS
6357	239	105D	L				HYDR	10-24-72	HENRY	ALA UNIV
6360	240	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6361	241	103D	LH			ARIZ		10-24-72	HENDRICKSØN	ARIZ UNIV
6362	242	1414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6363	243	1414	RLH			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
6364	244									
6365	245	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6366	246	F360	RLØ				HMET	8-31-72	CAMPBELL	-ØNTARIØ
6367	247	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6370	248	1384	LH				GEØL	8-31-72	EATØN	USGS-CALIF
6371	249	1340	RLH				HYDR	8-31-72	PAULSØN	USGS-HARISBG
6372	250	1384	LH				GEØL	10-24-72	EATØN	USGS-CALIF
6373	251	P568	L			VIRG		10-24-72	GREELEY	MITRE CØRP-VA
6374	252									
6375	253	N024	RLH				HYDR	12-15-72	KRIEGER	NASA-WALLØPS
6376	254									
6377	255									
6400	256									
6401	257	N024	RLH				HYDR	7-23-72	KRIEGER	NASA-WALLØPS
6402	258	1390	L				HYDR	10-24-72	BEAMER	USGS-HARISBG
6403	259									
6404	260									
6405	261									
6406	262									
6407	263									
7000	512	P550	LØ	40-05N	75-23W	PENN	TEST	7-23-72	WØØD	GE-VF
7001	513	P550		40-05N	75-23W	PENN	TEST	7-23-72	WØØD	GE-VF
7701	961	106D		38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
7707	967	106D	LØ	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC

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JMW
GSFC-430
12-20-72

ERTS DCS PLATFORMS
SORTED BY USER AFFILIATION

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USER ID	PROD REQ	PLATFORM OCT	PLATFORM DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
104D	LH	6140	96	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
104D	LH	6175	125	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
104D	LH	6317	207	44-16N	103-47W	SDAK	AGFR	7-23-72	HELLER	USDA-CALIF
D002	RLH	6010	8	41-45N	71-27W	RI	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6012	10				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6021	17	44-52N	69-51W	MAIN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6042	34				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6071	57				HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6101	65				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6106	70	43-48N	70-47W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
D002	RLH	6127	87	41-46N	72-40W	CONN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6142	98	42-34N	71-47W	MASS	HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6147	103				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6170	120	45-14N	68-39W	MAIN	HYDR	11-07-72	COOPER	ARMY ENG MASS
D002	RLH	6171	121				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6201	129				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6206	134	43-45W	71-41W	NH	HYDR	11-07-72	COOPER	ARMY-ENG-MASS
D002	RLH	6207	135	42-24N	71-13W	MASS	HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6216	142				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6220	144				HYDR	7-23-72	COOPER	ARMY ENG-MASS
D002	RLH	6233	155				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6242	162				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6246	166	42-15N	71-00W	MASS	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6254	172				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6271	185	47-15N	68-35W	MAIN	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6272	186				HYDR	11-07-72	COOPER	ARMY ENG MASS
D002	RLH	6273	187				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6304	196	44-04N	70-12W	MAIN	HYDR	11-27-72	COOPER	ARMY-ENG-MASS
D002	RLH	6325	213				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6335	221				HYDR	11-07-72	COOPER	ARMY ENG-MASS
D002	RLH	6345	229				HYDR	11-27-72	COOPER	ARMY ENG MASS
D002	RLH	6355	237	42-06N	72-38W	NY	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D002	RLH	6356	238	42-15N	71-15W	MASS	HYDR	8-31-72	COOPER	ARMY ENG-MASS
D011	LH	6074	60				HYDR	10-24-72	KEE	USN OCEANGRAPH
D011	LH	6153	107				HYDR	10-24-72	KEE	USN OCEANGRAPH
D011	LH	6336	222				HYDR	10-24-72	KEE	USN OCEANGRAPH
N024	RLH	6014	12				HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6022	18				HYDR	8-31-72	KRIEGER	NASA-WALLOPS

N024	RLH	6023	19		HYDR	11-08-72	KRIEGER	NASA-WALLOPS
N024	RLH	6032	26		HYDR	8-31-72	KRIEGER	NASA-WALLOPS
N024	RLH	6035	29		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6050	40		HYDR	11-08-72	KRIEGER	NASA-WALLOPS
N024	RLH	6052	42		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6072	58		HYDR	8-31-72	KRIEGER	NASA-WALLOPS
N024	RLH	6133	91		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6221	145		HYDR	7-23-72	KRIEGER	NASA-WALLOPS
N024	RLH	6226	150		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6305	197		HYDR	8-31-72	KRIEGER	NASA-WALLOPS
N024	RLH	6324	212		HYDR	11-08-72	KRIEGER	NASA-WALLOPS
N024	RLH	6333	219		HYDR	11-08-72	KRIEGER	NASA-WALLOPS
N024	RLH	6350	232		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6360	240		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6375	253		HYDR	12-15-72	KRIEGER	NASA-WALLOPS
N024	RLH	6401	257		HYDR	7-23-72	KRIEGER	NASA-WALLOPS
N347	L	6044	36		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6045	37		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6077	63		HYDR	7-23-72	ERB	NASA-MSC
N347	L	6112	74		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6125	85		HYDR	7-23-72	ERB	NASA-MSC
N347	L	6152	106		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6211	137		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6234	156		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6235	157		HYDR	8-31-72	ERB	NASA-MSC
N347	L	6244	164		HYDR	8-31-72	ERB	NASA-MSC
I015	LH	6004	4	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6013	11	MISS	HYDR	12-15-72	PREBLE	USGS-MISS
I015	LH	6017	15	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6024	20	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6025	21	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6040	32	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6051	41	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6056	46	MISS	HYDR	9-22-72	PREBLE	USGS-MISS
I015	LH	6062	50	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6075	61	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6107	71	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6110	72	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6122	82	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6136	94	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6143	99	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6157	111	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6166	118	MISS	HYDR	9-22-72	PREBLE	USGS-MISS
I015	LH	6202	130	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6204	132	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6212	138	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6230	152	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6241	161	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6245	165	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6251	169	MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6257	175	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6263	179	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6266	182	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6301	193	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6303	195	MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6307	199	MISS	HYDR	12-15-72	PREBLE	USGS-MISS

I015	LH	6327	215			MISS	HYDR	8-31-72	PREBLE	USGS-MISS
I015	LH	6337	223			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6347	231			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I015	LH	6351	233			MISS	HYDR	11-27-72	PREBLE	USGS-MISS
I023	LH	6020	16	40-30N	121-15W	CALF	GEOL	8-31-72	FRIEDMAN	USGS-WASH-DC
I023	LH	6104	68	40-30N	121-20W	CALF	GEOL	8-31-72	FRIEDMAN	USGS-WASH-DC
I066	LH	6006	6				HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
I066	LH	6016	14				HYDR	7-23-72	SCHUMAN	USGS-PHOENIX
I066	LH	6151	105				HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
I066	LH	6165	117				HYDR	9-22-72	SCHUMAN	USGS-PHOENIX
I066	LH	6177	127				HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
I066	LH	6225	149				HYDR	9-22-72	SCHUMAN	USGS-PHOENIX
I066	LH	6261	177	34-38N	111-51W	ARIZ	HYDR	8-31-72	SCHUMAN	USGS-PHOENIX
I340	RLH	6030	24	41-02N	75-01W	PENN	HYDR	7-23-72	PAULSON	USGS-HARISBG
I340	RLH	6046	38				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6067	55				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6114	76				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6115	77	39-58N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6116	78	41-16N	74-47W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6124	84	39-30N	75-34W	PENN	HYDR	7-23-72	PAULSON	USGS-HARISBG
I340	RLH	6215	141				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6223	147	41-00N	75-05W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6227	151				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6275	169				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6277	191				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6306	198	40-41N	75-12W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6312	202				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6322	210				HYDR	10-24-72	PAULSON	USGS-HARISBG
I340	RLH	6331	217	40-42N	75-11W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6332	218	39-41N	75-31W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6341	225				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6343	227	40-04N	74-51W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6344	228	39-50N	75-22W	PENN	HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6367	247				HYDR	8-31-72	PAULSON	USGS-HARISBG
I340	RLH	6371	249				HYDR	8-31-72	PAULSON	USGS-HARISBG
I378	L	6144	100				HYDR	11-08-72	CAMERON	USGS-LOUISANA
I378	L	6237	159				HYDR	11-08-72	CAMERON	USGS-LOUISANA
I380	L	6063	51	42-40N	70-54W	MASS		11-27-72	KNOX	USGS-BOSTON
I381	L	6037	31				HYDR	10-24-72	BARNES	USGS-NASHVILE
I381	L	6203	131				HYDR	10-24-72	BARNES	USGS-NASHVILE
I382	L	6264	180					10-24-72	KAPUTSKA	USGS-OREGON
I384	LH	6005	5				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6011	9				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6034	28				GEOL	9-22-72	EATON	USGS-CALIF
I384	LH	6036	30				GEOL	10-24-72	EATON	USGS-CALIF
I384	LH	6043	35				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6057	47				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6066	54				GEOL	7-23-72	EATON	USGS-CALIF
I384	LH	6103	67				GEOL	8-31-72	EATON	USGS-CALIF
I384	LH	6117	79				GEOL	10-24-72	EATON	USGS-CALIF

1384	LH	6132	90				GEOL	10-24-72	EATON	USGS-CAL&F
1384	LH	6154	108				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6162	114				GEOL	7-23-72	EATON	USGS-CALIF
1384	LH	6163	115				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6176	126				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6213	139				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6247	167				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6240	160				GEOL	10-24-72	EATON	USGS-CALIF
1384	LH	6262	178				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6274	188				GEOL	10-24-72	EATON	USGS-CALIF
1384	LH	6276	190				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6311	201				GEOL	10-24-72	EATON	USGS-CALIF
1384	LH	6315	205				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6320	208				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6334	220				GEOL	9-22-72	EATON	USGS-CALIF
1384	LH	6342	226				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6365	245				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6370	248				GEOL	8-31-72	EATON	USGS-CALIF
1384	LH	6372	250				GEOL	10-24-72	EATON	USGS-CALIF
1390	L	6402	258				HYDR	10-24-72	BEAMER	USGS-HARISBG
1414	RLH	6031	25			FLA	HYDR	7-23-72	HIGER	USGS-MIAMI
1414	RLH	6033	27			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6055	45			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6070	56			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6121	81			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6141	97			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6214	140			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6236	158			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6250	168			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6252	170			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6256	174			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6313	203			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6321	209			FLA	HYDR	8-31-72	HIGER	USGS-MIAMI
1414	RLH	6352	242			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI
1414	RLH	6353	243			FLA	HYDR	12-15-72	HIGER	USGS-MIAMI

UNIVERSITIES

USER ID	PROD REQ	PLATFORM OCT	DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
105D	L	6060	48				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6061	49				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6105	69				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6120	80				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6156	110				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6164	116				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6224	148				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6265	181				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6323	211				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6346	230				HYDR	10-24-72	HENRY	ALA UNIV
105D	L	6357	239				HYDR	10-24-72	HENRY	ALA UNIV

USER ID	PROD REQ	PLATFORM OCT	DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
103D	LH	6047	39			ARIZ		10-24-72	HENDRICKSON	ARIZ UNIV
103D	LH	6167	119			ARIZ		10-24-72	HENDRICKSON	ARIZ UNIV
103D	LH	6361	241			ARIZ		10-24-72	HENDRICKSON	ARIZ UNIV
100D	LH	6007	7				HMET	9-22-72	HOFFER	COLORADO UNIV
100D	LH	6054	44				HMET	9-22-72	HOFFER	COLORADO UNIV
U661	LH	6131	89			KANS		10-24-72	KANEMASU	KSU-KANSAS
U661	LH	6310	200			KANS		10-24-72	KANEMASU	KSU-KANSAS

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*   FOREIGN    *
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USER ID	PROD REQ	PLATFORM OCT	DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
F360	RLB	6102	66				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6126	66	50-38N	117-03W	BC	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6137	95				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6150	104	59-23N	108-53W	SASK	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6232	154				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6260	176	61-52N	121-21W	NWT	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6353	235				HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6354	236	51-01N	118-05W	BC	HMET	8-31-72	CAMPBELL	-ONTARIO
F360	RLB	6366	246				HMET	8-31-72	CAMPBELL	-ONTARIO
F368	RL	6270	184	46-52N	71-39W	QUEB	HMET	8-31-72	PERRIER	RESOURCES-QUE
F461	RLB	6210	136				HMET	8-31-72	KRUUS	FISH-OTTAWA
F501	RL	6222	146				HMET	8-31-72	ZUBRYCKY	FISH-OTTAWA
F502	RLB	6135	93	43-17N	79-08W	ONT	HMET	8-31-72	MACPHAIL	IN WATER-ONT
F503	RL	6330	216				HMET	8-31-72	VOCKEROTH	ATMOS-ONT

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*             *
*   PRIVATE   *
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USER ID	PROD REQ	PLATFORM OCT	DEC	LAT	LONG	LOC	STUDY	VALID	USER	AFFILIATION
106D		7701	961	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
106D	LB	7707	967	38-59N	76-51W	GSFC	TEST	7-23-72	SMITH	NASA-GSFC
P550	LB	7000	512	40-05N	75-23W	PENN	TEST	7-23-72	WOOD	GE-VF
P550		7001	513	40-05N	75-23W	PENN	TEST	7-23-72	WOOD	GE-VF
P568	L	6073	59			VIRG		10-24-72	GREELEY	MITRE CORP-VA
P568	L	6373	251			VIRG		10-24-72	GREELEY	MITRE CORP-VA

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*             *
*    STATE    *
*             *
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USER ID	PRØD REQ	PLATFØRM ØCT	DEC	LAT	LØNG	LØC	STUDY	VALID	USER	AFFILIATIØN
102D	L	6155	109			ØHIØ		10-24-72	SWEET	BATTELLE LABS

STØP 0

APPENDIX D

ERTS-1 FLIGHT HARDWARE OPERATING TIME SUMMARY

Table 1. ERTS-1 Flight Hardware Operating Time Summary as of 23 July 1972

Subsystem	Module	S/N*	Test Hours**
Command	Clock	FT-1	1895
	VHF Receiver	02	2536
	CIU	6549450	2523
VIP	Digit Mux	0004	2439
	Reprogrammer	0004	2439
	Analog Mux	0003	2504
	Memory Sequencer	0004	2557
	Memory A/B	0005/0007	2567
Power	S/C Regulator	007	2549
	P/L Regulator	008	2542
	Aux Load Cont	6549313	2526
	Aux Load Panel 2	6549311	297
	Aux Load Panel 1	6549288	297
	Battery 1	37	2418
	Battery 2	38	2818
	Battery 3	41	2407
	Battery 4	35	2405
	Battery 5	34	2419
	Battery 6	39	2385
	Battery 7	36	2418
	Battery 8	33	2418
	ISM	EAB-FT-1	2535
	PSM	6549500	2459
RBV	RBV Elect 1	007	230
	RBV Elect 2	005	221
	RBV Elect 3	006	217
	RBV Camera 1	007	230
	RBV Camera 2	005	221
	RBV Camera 3	006	217
	CCC	004	306
	Mag. MOM Comp	6549512	206
MSS	MSS Scanner System	1	270
	MSS Multiplexer	2	270
	MSS Scanner	1	270
WBVTR	WBVTR Elect 1	Proto	268
	WBVTR 1 (T/T)	Proto	268
	WBVTR 1 (R/P)	Proto	126
	WBVTR Elect 2	FT-3	88
	WBVTR 2 (T/T)	FT-3	90
	WBVTR 2 (R/P)	FT-3	45
OA	OA	FT-1	
	SOL 1		Firings - 54
	SOL 2		52
	SOL 3		50
APU	APU	6549503	1861
Narrowband Telemetry	Beacon Transmitter	0003	2250
	NBTR 2	EAB-FT-1	1437
	NBTR 1	EAB-FT-2	1370
	USBE	EAB-FT-2	177
	PMP	FT-1	2354
Thermal	TM Conv Mod 3	6549315	2365
	TM Conv Mod 1	5962964	2359
	TM Conv Mod 2	5962965	2358
Unfold	Unfold Timer	5962963	12
DCS	DCS A	FT-4	370
	DCS B	FT-5	256
WBTSS	WBPA 1	QM-1	468
	WBPA 2		474
	WBPS	6549509	597
	WBFM	6549506	586
	WB Output Filter 1	3	168
	WB Output Filter 2	6	178
ACS	Right SAD	FT-03	1800
	Left SAD	FT-02	1035
	Yaw Rate Gyro	FT-2	327
	RMP "A"	FT-02	725
	RMP "B"	FT-03	743
	Logic Box	FT-1	2500
	Scanner No. 1	FT-2	2500
	Scanner No. 2	FT-6	1344
	Timer	005	2315
	Pitch Flywheel	706 003	1773
	Yaw Flywheel	908 005	2315
MMCA	MMCA	FT-1	15
AMS	AMS	FT-1	1094

* Extracted from consolidated configured articles list, issued July 7, 1972.
**Extracted from quality assurance LOS books.